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BOVIEN (P.). **Some Types of Association between Nematodes and Insects.**—*Vidensk. medd. dansk. naturh. For.* **101** repr. 114 pp., 31 figs., 106 refs. Copenhagen, C. A. Reitzel, 1937.

Types of association between some of the ANGUILLULIDAE and insects are discussed at length, and an account is given of the biology of several of these Nematodes, together with descriptions of 1 new genus and 9 new species. The literature is fully reviewed. Alternation of sexual and parthenogenetic generations, which has not previously been recorded in the ANGUILLULININAE, was observed in *Heterotylenchus aberrans*, gen. et sp. n., which was found parasitising the onion fly, *Hylemyia antiqua*, Mg., in one locality in Denmark in 1932. From 9 to 25 per cent. of the flies were infested, both sexes being equally attacked. An enormous number of Nematode eggs and larvae, together with 1–4 large females and many of a much smaller, morphologically distinct, type, usually occurred in the body-cavity of an infested fly. The large females belong to the sexual generation and produce a moderate number of eggs that give rise to a generation of smaller, parthenogenetic females. These spend their lives within the body-cavity of the host and lay many eggs, from which larvae of both sexes develop. When these larvae are in a female host and are ready to undergo their final moult, they penetrate the ovaries and assemble in the oviduct until they are able to escape by the genital aperture. In the following free-living stage, they moult and become adult. The fertilised female then penetrates a host larva and the cycle begins again. The free-living worms were obtained by confining flies over a piece of gauze resting on wet onion leaves in a petri dish. The next day many Nematodes were found on the leaves and in drops of water. The males soon died, but the females lived for about a week. Of newly hatched *Hylemyia* larvae collected in the field, about 10 per cent. were infested by female Nematodes only slightly more advanced than the free-living forms. Details are given of the structure and development of the different stages. Female hosts were generally rendered sterile by the Nematodes, but the testes of infested males were apparently not invaded and contained ripe spermatozoa. The parasites have apparently no chance of leaving a male host, and as the male flies do not live so long as the females, they often die before the Nematodes in them have reached the parthenogenetic stage.

In some species of Nematodes, the larvae may undergo a more or less prolonged resting stage and are then known as " Dauerlarven." These may be internal parasites, or they may be loosely attached to the surface of insects or even tightly twined round them, as in the intersegmental furrows of Psychodids. " Dauerlarven " of *Neoaplectana bibionis*, sp. n., and *N. affinis*, sp. n., were found in the larval gut of *Bibio ferruginatus*, L., *B. hortulanus*, L., and *Dilophus febrilis*, L. (*vulgaris*, Mg.) in practically all samples of Bibionid larvae from various localities in Denmark in 1931–35. Nematodes were found in the body-cavity of one living pupa, but only in the gut of living larvae. It is thought that they enter them *per os*, but do not usually develop further unless the host dies. In some samples, up to 90 per cent. of the larvae were infested and some contained over 100 Nematodes in the intestine. If the host dies, the larvae enter the body-cavity, become adult, and multiply rapidly. In such cases, larvae that are unable to escape from the intestine may become adult, but generally appear abnormal. Two larvae of a species of

(143) Wt. P4/3637 1700 2/38 S.E.R. Ltd. Gp. 253 [A]

Telephorus that were placed in a culture of heavily infested *Bibio hortulanus* became moribund in a few days and were then dissected. Pre-adult larvae and adults of *N. affinis* were found in the body cavity, and some " Dauerlarven " in the gut and malpighian vessels. The Nematodes were also found in a larva of *Tipula paludosa*, Mg., that had been kept in infested cultures. These two species are thus remarkable in combining both parasitic and saprozoic characters. Both were successfully cultured on dead and mutilated insect larvae, and in a suitable medium no resting stage occurred, the entire life-cycle occupying about 4 days. *N. bibionis* was more viable than *N. affinis*, and, with transfers, a culture could be maintained for about 3 months, whereas it was difficult to prolong one of *N. affinis* beyond one generation. " Dauerlarven " of *N. bibionis*, kept in a small dish with tap-water, remained alive for 12 months. In some cultures in which Bibionids were reared to the adult stage, a considerable number of " Dauerlarven " were found clinging to them.

The females of both species are at first oviparous, but later become viviparous. Occasionally the larvae become adult and remain in the uterus after the death of the parent. Descriptions are given of the structure and development of the different stages.

Böhmel (W.). **Untersuchungen über die Nahrungsaufnahme von berüsselten Kleinschmetterlingen und deren Bekämpfung durch Giftköder.** [Investigations on the Taking up of Food by Microlepidoptera with a Proboscis and their Control by Poison Baits.]—*Arb. physiol. angew. Ent. Berl.* **4** no. 3 pp. 169–192, 17 refs. Berlin, 30th September 1937.

In an introductory note, C. Börner points out that bait-traps are no longer used to control insects with sucking mouth-parts, but serve merely to indicate their appearance and abundance. The possibility of using baits in the form of sprays or dusts against Lepidoptera has been neglected, as it has been assumed that they can take up liquids only. The outbreak of ermine moths (*Hyponomeuta*) in central Germany in 1931–32 [*R.A.E.*, A **21** 525] provided an opportunity for investigating this question. Böhmel found that the moths were killed by poison bait even when it had dried up and remained dry throughout the tests, so that the moths must have liquefied it with their saliva and then absorbed it. This was shown to be true for various moths in the experiments here described by him which were carried out in 1931–33.

With *Hyponomeuta*, the bait-sprays contained either 0·4 per cent. sodium fluoride with sugar or molasses or 1 per cent. of an acetone extract of *Derris elliptica* with sugar. In some tests, a dye was added to the spray and was traced on dissection, which confirmed direct observation of feeding. In the laboratory, all adults placed on sprayed leaves before and after the spray had dried were dead in 2–3 days. These results were confirmed by tests in field cages, and in a test on plum trees in the open the number of moths was greatly reduced within 2–5 days, in spite of rain. With molasses the toxic action was a little slower than with sugar, and derris was the more effective poison.

Adults of *Tortrix viridana*, L., bred from pupae were used in the laboratory and in a cage test in the open. The sodium fluoride solution with sugar was sprayed on oak leaves and, both before and after it had dried, caused total mortality in 3–5 days. Adults of *Clysia*

ambiguella, Hb., bred from larvae and used in tests in the laboratory and in glasses placed in the open to ensure field temperatures, ingested wet and dry sodium fluoride sweetened with sugar or molasses and all died in 2–5 days. With molasses the toxic action was again a little slower than with sugar.

A few adults of *Polychrosis botrana*, Schiff., were used for tests limited to dyeing food ; they showed that this species also takes up both liquid and solid food.

Various tests showed that smell played little part in the attractiveness of the bait. The proboscis is unrolled when the leaf surface is touched and sucking begins when the tip of the proboscis touches water or a food (sugar). The ingestion of the poison is accelerated by the addition of a sugary carrier. Derris did not produce any scorching, but sodium fluoride did. When combining a bait poison with a fungicide, especially Bordeaux mixture, an increase of sugar is required to counteract any repellent taste.

TISCHLER (W.). **Untersuchungen über Wanzen an Getreide.** [Investigations on Bugs on Cereals.]—*Arb. physiol. angew. Ent. Berl.* **4** no. 3 pp. 193–231, 13 figs., 3 pls., 3 pp. refs. Berlin, 30th September 1937.

The literature on bugs injurious to cereals is briefly surveyed, and a detailed account is given of the results of investigations in 1936 on 5 species actually found in abundance sucking the grains in Schleswig Holstein, namely *Eurygaster maura*, L., *Aelia acuminata*, L., *Palomena prasina*, L., *Dolycoris baccarum*, L., and *Carpocoris pudicus fuscispinus*, Boh. [*cf. R.A.E.*, A **25** 207, 584]. The distribution of these Pentatomids in the Palaearctic Region is briefly discussed and shown on a map, the eggs and nymphs are described in detail, and the chief characters distinguishing the adults are indicated.

In Schleswig Holstein, *A. acuminata* seemed to have the most restricted biotope. It was very abundant in dry places where there were grasses, heather, *Genista* and small pines. In meadows in which *Aira flexuosa* and *Festuca ovina* were growing together, it was always found on the latter. *E. maura* also occurred chiefly in dry places, whereas the other three species were common in meadows. In adjacent cereal fields, all five decreased in abundance from the edges to the centre.

From October to April, the adults are in their winter quarters, usually on dry grassy ground near the cereal fields. They reappeared in the fields in April and paired, and the females oviposited on the ears, leaves and stalks of the cereals. Oviposition continued until early July, when the overwintered adults died off. By then most of the nymphs of *Aelia*, *Eurygaster* and *Dolycoris* were in the fifth instar, and those of *Palomena* and *Carpocoris* in the second. The bugs occurred on a variety of food-plants, lists of which are given for each species. All five were found on wheat, rye, barley and oats. They preferred to feed on seeds, both of weeds and cereals. Early injury by *E. maura* caused " white ear " in wheat or led to the ear remaining in the leaf-sheath. The puncturing of the grains, which extended to the uppermost starch layer, caused the greatest injury, but no differences in injury by the five species were noticed. A white area round the dark puncture was distinguishable only in wheat grains, and in rye there was merely a slight discolouration.

At temperatures of 18–23°C. [64·4–73·4°F.], the egg stage lasted about 9–10 days in all species. The process of hatching is described. In the first instar the nymphs could live without feeding; they usually attacked cereals in the third instar after passing the second on weeds, but they could dispense with weeds even in the early instars and develop on the milk-ripe grains of cereals. They moulted 5 times and, at an average temperature of 20·7°C. [69·26°F.], their development took about 2 months. At the date of the rye harvest (23rd July 1936), the percentages of adults among the individuals caught were 46·2 for *Eurygaster*, 28·8 for *Dolycoris*, 16·2 for *Aelia*, and 0 for *Palomena* and *Carpocoris*. In mid-August, only 2·1 per cent. of 300 individuals of *Palomena* taken in an oat field were adults, as compared with over 70 per cent. of the other species. From harvest time until migration to their winter quarters, the bugs remain in the stubble or move to neighbouring fields or edges of woods.

JANCKE (O.). **Frostspanneruntersuchungen.** [Investigations on the Winter Moth.]—*Arb. physiol. angew. Ent. Berl.* **4** no. 3 pp. 232–244, 2 graphs, 10 refs. Berlin, 30th September 1937.

Observations at Naumburg a. d. Saale (central Germany) from 1920 to 1935, inclusive, showed that in 12 years the adults of *Operophtera brumata*, L., appeared during the last 10 days of October. In the other 4 years the dates were 17th October and 2nd, 3rd and 5th November. No relation was observed between the dates of emergence and either the average temperatures from May to October or the first frost, and there was no definite connection between adult emergence and rainfall during the larval and pupal periods, so that differences in soil moisture cannot influence the beginning of emergence. On the average, the adults could be found for a period of five weeks and were most numerous during the second and third weeks of this period. No definite relation between the duration of adult occurrence and climatic factors during the larval and pupal periods or microclimate could be found.

As regards control, it was ascertained that adhesive banding need not retain its tenacity for more than 2 months, a requirement met by all commercial brands. Direct application of the adhesive to the bark did not harm apple, pear, plum or cherry trees.

ABRAHAM (R.). *Halticus saltator* **Geoffr. als Schädling der Ringelblume** (*Calendula officinalis* **L.**). [*H. saltator* as a Pest of Marigold.]—*Arb. physiol. angew. Ent. Berl.* **4** no. 3 pp. 244–246, 3 figs., 4 refs. Berlin, 30th September 1937.

Adults of *Halticus saltator*, Geoffr., were observed in June 1937 causing whitish-yellow spots on the leaves of marigold (*Calendula officinalis*) near Heidelberg. Both leaf-surfaces were attacked by the bugs, which preferred the upper surface in sunny weather and the lower one in cloudy weather. After heavy rain in the second half of June, the bugs disappeared. Other cultivated plants from which this Capsid has been recorded in Germany are gherkin and celery.

KAYASHIMA (I.). **On** *Brithys crini* **Fabr. very injurious to ornamental Plants.** [*In Japanese.*]—*Shokubutsu Kensa Shiryo* **6** no. 5–6 pp. 5–7. Taihoku, Formosa, October 1937.

The larvae of *Brithys crini*, F., all stages of which are described, cause serious injury to the leaves of *Zephyranthes candida*, *Amaryllis*,

Narcissus papyraceus and *Rohdea japonica* in Formosa. This Noctuid, which hibernates in the pupal stage, appears to have more than two generations a year at Taihoku, the adults emerging in March and from mid-May to mid-July. A female lays about 200–300 eggs, which hatch in 5–7 days, and the larval and pupal stages last about a month and 10 days, respectively.

NAWA (U.). **On *Aphis laburni* Kalt., a Pest of *Astragalus sinicus*.** [*In Japanese.*]—*Insect World* **41** nos. 8–10 pp. 292–298, 332–336, 389–393. Gifu, August–October 1937.

In the neighbourhood of Gifu, Japan, *Aphis laburni*, Kalt., causes serious damage to *Astragalus sinicus*, which is used as a green manure crop, and *Phaseolus*. It is most abundant from June to September, but produces viviparous generations throughout the year ; no sexual forms were observed and no winged forms in winter. A female produces an average of 87·3 offspring.

MITSUHASHI (H.). **Summer Fumigation of *Citrus* and the Methods.** [*In Japanese.*]—*J. Plant Prot.* **24** no. 10 pp. 767–774. Tokyo, October 1937.

In Japan, fumigation of *Citrus* with hydrocyanic acid gas is more effective in summer than in winter and destroys scale insects on the fruits. Satisfactory control, without injury to the trees, is obtained by using 18 gm. potassium cyanide and 18 gm. sulphuric acid in 36 cc. water per 100 cu. ft. for 25 minutes at 33°C. [91·4°F.].

YAGO (M.) & FURUGORI (N.). **On the scientific and Japanese Names of Mites on Pear in Japan.** [*In Japanese.*]—*J. Plant Prot.* **24** no. 11 p. 842. Tokyo, November 1937.

The mites found on pear in Japan [*cf. R.A.E.*, A **25** 713] have been identified as *Paratetranychus pilosus*, C. & F., which also attacks peaches, and *Tetranychus* sp.

HARUKAWA (C.) & KUMASHIRO (S.). **On *Tipula aino* Alex. III. Control Methods (Preliminary Studies).** [*In Japanese.*]—*Nogaku-Kenkyu* **28** pp. 305–332. Kurashiki, 1937.

Young larvae of *Tipula aino*, Alexander, a pest of rice in Japan [*cf. R.A.E.*, A **25** 477, etc.], are sometimes found in shallow water, and full-grown ones, though never in nature entirely submerged, are not killed by being kept so for 6 days in December, though most of them do not survive for 11 days. The periods of submergence that gave complete mortality in experiments at constant temperatures were 7–8 days at 15°C. [59°F.], 3–4 at 20°C. [68°F.], 1–2 at 25°C. [77°F.] and 1 at 30°C. [86°F.] in winter, and 3–4 at 15°C., 1–2 at 20°C., and 1 at 25°C. in summer. Dusting full-grown larvae on the surface of the soil with nicotine or pyrethrum killed only a few, the rest escaping into the soil, but over 90 per cent. of those in the soil in winter were destroyed by spraying or pouring petroleum oil emulsion, with or without pyrethrum, over the surface. All larvae in soil in a container were killed by fumigation with carbon bisulphide, at a rate equivalent to 3 lb. per 1,000 cu. ft., for 16 hours, shorter exposures being less

effective, and with cyanide at the rate of 10·5 oz. per 1,000 cu ft. for 24 hours in winter. In the field, carbon bisulphide or sodium ethyl xanthate was less effective, while cyanide gave about 85 per cent. mortality, but these fumigants injured wheat infested by *T. aino* in old rice-fields.

KUMASHIRO (S.). **Food-plants of Scarabaeidae near Kurashiki, Okayama Prefecture, Japan.** [*In Japanese.*]—*Nogaku-Kenkyu* **27** pp. 333–345. Kurashiki, 1937.

A list is given of the food-plants of adult Lamellicorns, including *Popillia japonica*, Newm., *Anomala cuprea*, Hope, *A. rufocuprea*, Motsch., and *Adoretus tenuimaculatus*, Waterh., with notes on their emergence periods.

KUMASHIRO (S.). **On the Acceleration of Development of hibernating Insects by artificial Temperatures.** [*In Japanese.*]—*Nogaku-Kenkyu* **28** pp. 361–372. Kurashiki, 1937.

The completion of development of the hibernating stages of *Pieris rapae*, L., *Pyrausta nubilalis*, Hb., *Sesamia inferens*, Wlk., *Oxya* spp., *Echnocnemus bipunctatus*, Roel., and *Hoplocampa pyricola*, Rohw., took place earlier when they were transferred to higher constant or variable temperatures than under natural conditions.

KUMASHIRO (S.). **Observations on some Insects that are positively phototropic.** [*In Japanese.*]—*Nogaku-Kenkyu* **28** pp. 373–394. Kurashiki, 1937.

Observations are recorded on nine species of insects caught in light-traps at Kurashiki. Of these, *Cremastus flavo-orbitalis*, Cam. (*biguttulus*, Munak.), an Ichneumonid parasite of *Chilo simplex*, Btlr., was taken from late May to early October, and was most common in late June or early July and again in late August and early September. The numbers of individuals taken, 30 per cent. of which were females, were 3·8–11·8 per cent. of the numbers of adults of *C. simplex*. *Malacosoma neustria testacea*, Motsch., which is injurious to pear, peach and other fruit-trees, was caught from late May to the end of June, only 1·2 per cent. of the individuals taken being females. Their ovaries contained an average of 182·8 eggs. *Nephotettix bipunctatus cincticeps*, Uhler, was attracted from June to early October, being numerous in late June, early August and early September ; 49·5 per cent. were females.

UCHIDA (T.) & OKADA (I.). **Life-history of *Grapholitha glycinivorella* Mats. in Manchuria. (Preliminary Report.)** [*In Japanese.*]—*Kontyû* **11** no. 5 pp. 331–343, 5 figs. Tokyo, September 1937.

Cydia (*Grapholitha*) *glycinivorella*, Mats., which is very injurious to soy beans in Manchuria [*cf. R.A.E.*, A **24** 788], has one generation a year. The adults occur in August and early September, living for 10–13 days. The females lay their eggs singly, on the pods and sometimes on the leaves and twigs. The larvae hatch in 7–8 days and are full-fed in 18–21 days. They then enter the soil and hibernate in cocoons. Pupation begins late in the following July, and the moths emerge 11–13 days afterwards.

Esaki (T.). **The large Termite, *Zootermopsis angusticollis* Hagen introduced from Oregon, U.S.A., to Japan.** [*In Japanese.*]—*Kontyû* **11** no. 5 pp. 344–346, 1 fig. Tokyo, September 1937.

Nymphs and an immature soldier of the termite, *Zootermopsis angusticollis*, Hagen, have been observed at Hiroshima, Japan, infesting timber recently imported from Oregon.

Cherian (M. C.). **Administration Report of the Government Entomologist, Coimbatore, for 1936–37.**—[*Rep. Dep. Agric. Madras 1936–37*] pp. 126–133B. [Coimbatore] 1937.

Investigations on insect pests in South India in 1936–37 are briefly reviewed. The life-cycle of *Ripersia sacchari*, Green, on sugar-cane was found to occupy about 40 days. In tests of light-traps for the control of *Schoenobius bipunctifer*, Wlk. (*incertellus*, Wlk.) on rice, infestation within 350 yards of the trap was 0·37–2·21 per cent., and outside this radius 2–7 per cent. Young hoppers of *Hieroglyphus banian*, F., began to emerge in the second week in June and were abundant in August and September, after which they disappeared. Infestation of rice amounted to 2–17 per cent. *Mermis nigrescens*, Duj., was found parasitising some individuals. Pests of fruit trees included *Dasynus antennatus*, Kby., on orange and *Helopeltis antonii*, Sign., on guava. The latter may be controlled by spraying with crude oil emulsion and Bordeaux mixture. *Saissetia nigra*, Nietn., is found in large numbers on cotton, sometimes killing the plant. As portia trees [*Thespesia populnea*] were thought to be centres of infestation, one tree was pruned and sprayed with lime-sulphur and another used as a control. Infestation of cotton plants around the two trees amounted to 6·1 and 51 per cent., respectively. During November and December, about 60 per cent. of the Coccids were parasitised by *Scutellista cyanea*, Motsch. Larvae of *Laphygma exigua*, Hb., which had not previously been noticed as a pest of tobacco nurseries in South India, occurred in them in large numbers. It breeds throughout the year on a sand-dune weed, *Gisekia pharnaceoides*, and is attacked by two Tachinid parasites, *Sturmia inconspicuoides*, Baranov, and *Actia monticola*, Mall., and the Reduviid, *Rhynocoris fuscipes*, F. Dusting with flowers of sulphur was effective against *Scirtothrips dorsalis*, Hood, one of the most important pests of chillies [*Capsicum*]. It was proved that adults and nymphs of *Peregrinus maidis*, Ashm., are able to transmit the freckled yellow disease of cholam [*Sorghum*]. They did not transmit the stripe disease ; and neither disease was transmitted by Aphids. Pests of moringa included *Noorda blitealis*, Wlk., which attacks the leaves, and an undescribed species of the same genus, which attacks the buds. Sprays of calcium arsenate were effective against both species, and Bordeaux mixture acted as a repellent against the latter. Moringa was also attacked by *Stictodiplosis moringae*, Mani, which is found inside the flower buds and was noted for the first time in South India, and *Eupterote mollifera*, Wlk. Castor was seriously attacked by *Tetranychus telarius*, L.

The Coffee Stem Borer (*Xylotrechus quadripes* Chevr.) and its Control.—*Circ. Dep. Agric. Mysore* no. 57, 5 pp., 3 pls., 1 ref. Bangalore, 1937.

Recommendations for the control of *Xylotrechus quadripes*, Chevr., on coffee in Mysore [*cf. R.A.E.*, A **22** 476 ; **24** 5, etc.] include the

destruction by burning of all infested stems by about the end of August. Particular attention should be paid to the removal of infested bushes in small holdings, which are often neglected and act as foci of infestation for the neighbouring estates. Infestation may be considerably reduced by careful scrubbing of the stems, to remove the shelter under which the eggs are laid [**22** 476], in October and November, particularly round open spaces where the incidence of attack is likely to be heavy. This operation should be carried out systematically, so that in 2 or 3 years all bushes on an estate will have been treated. Swabbing the stems, especially those that have been scrubbed, in November and December with a 10 per cent. emulsion of a high boiling point coal-tar or wood-tar distillate kills both the eggs and the larvae, and also acts as a deterrent for the ovipositing females for about a fortnight after treatment. Wood-tar distillate is slightly the more effective. The cost of treatment is discussed.

Insect Pests and their Control.—*Agric. Gaz. N.S.W.* **48** pt. 8 pp. 460–464, 9 figs. Sydney, 1st August 1937.

This paper, which is one of a series on insect pests in New South Wales [*cf. R.A.E.*, A **25** 788], includes notes on *Orgyia anartoides*, Wlk., *Papilio anactus*, MacLeay, and *P. aegeus*, Don., all stages of which are briefly described. The larvae of *O. anartoides* infest fruit trees, vegetables and other plants [**21** 392] and pupate in flimsy silken cocoons on or near their food-plants. The wingless female deposits as many as 700 eggs on the outside of the cocoon. There are several generations annually, and though the life-cycle is prolonged at low temperatures, all stages occur in the Sydney district throughout the winter. The larvae of *P. aegeus* feed on the foliage of various Rutaceous plants, including *Citrus*. The eggs are generally laid singly on the younger leaves, and the pupae are attached to the food-plant. There is a succession of broods in the summer, but when pupation takes place in April, the adults do not emerge till the following spring. The bionomics of *P. anactus* are similar ; in summer the life-cycle occupies about 2 months.

The larvae of all these Lepidoptera may be controlled by spraying with 1 lb. lead arsenate in 40 gals. water.

Mungomery (R. W.). **The Present Situation regarding the Giant American Toad in Queensland.**—*Qd agric. J.* **48** pt. 2 p. 209. Brisbane, 1st August 1937.

Bufo marinus, which was introduced into Queensland [*R.A.E.*, A **25** 315, etc.] primarily for the control of the greyback beetle [*Lepidoderma albohirtum*, Waterh.], has now been liberated in many districts, a list of which is given. The first Australian-bred generation has become established, and young toads are abundant in the areas where the first liberations were made.

Dumbleton (L. J.). **Apple Leaf-hopper Investigations.**—*N.Z. J. Sci. Tech.* **18** no. 12 pp. 866–877, 8 figs., 7 refs. Wellington, N.Z., May 1937.

During the summer of 1934–35, counts were made at frequent intervals to determine the population of the leafhopper, *Typhlocyba froggatti*, Baker, on 4 apple trees in the Nelson district. At each

count 100 leaves were taken from each tree, 25 being selected from the top to the bottom of each quarter of the crown. The populations per 100 leaves at the peak of the two broods, in early November and February, were 31 and 56 nymphs, respectively, neither being large enough to cause extensive damage [*cf. R.A.E.*, A **22** 400]. Winter eggs in 1934 and 1935, and summer eggs in 1934–35, were parasitised by *Anagrus* [*armatus* var. *nigriventris*, Gir. (*cf.* **22** 656)] at the rate of 80, 90 and 66 per cent., respectively. The leafhopper population appears to remain fairly steady at a relatively low level from year to year, though it is stated to reach injurious proportions in some seasons. It is possible that such outbreaks as do occur may take place when weather conditions are unfavourable for this delicate Mymarid.

An attempt has been made to introduce the Dryinid, *Aphelopus typhlocybae*, Mues., from the eastern United States, where it parasitises *Typhlocyba pomaria*, McAtee [**24** 734], into New Zealand, where it is hoped to establish it on *T. froggatti*. A consignment of 1,250 cocoons containing larvae that left their hosts between 12th and 14th October 1935 was shipped on 23rd October and arrived in New Zealand on 12th November, having been kept at 40°F. Details of the technique used are given. Altogether, 371 adults emerged between 17th January and 10th March, and of these 239 were liberated. The adults readily parasitised nymphs of *T. froggatti* in all instars, but there was a heavy mortality in parasitised material in the laboratory, which was perhaps largely due to superparasitism, the hosts dying before the parasites had completed their development. Two mature larvae, however, left their hosts and spun cocoons, and a third left the host but failed to pupate. Details of the process of development of the parasite are given.

Dumbleton (L. J.). **Report on Leaf-roller in Central Otago.**— *N. Z. J. Sci. Tech.* **18** no. 12 pp. 877–887, 2 figs., 4 refs. Wellington, N.Z., May 1937.

Apricots in Central Otago are sometimes seriously damaged by Tortricids, of which *Tortrix excessana*, Wlk., is the most important. It also occurs on nectarines, plums and cherries, but they are not so severely infested, as arsenical sprays are used on them. As the attack on apricots appears to be concentrated on the fruits, which are eaten away round the stalk, heavy losses may be expected in varieties with large clusters. Thinning should reduce the damage, but may endanger the whole crop in the event of late frosts. Previous work has shown that *Tortrix postvittana*, Wlk., *T. excessana*, and *Ctenopseustis obliquana*, Wlk., have similar life-histories [*cf. R.A.E.*, A **21** 91 ; **24** 598]. In the Nelson district, they overwinter as larvae on evergreen food-plants, pupate in the spring and emerge soon afterwards. In Central Otago, however, there is less rain, the winter is more severe, and there is a scarcity of evergreen foliage. There the larvae of *T. excessana* overwintered on mummified fruit and in or under dead leaves webbed to the tree or on the ground, as well as on evergreens. Permanent ground cover is not regarded as an important source of infestation, as some cleanly cultivated orchards were the most heavily infested. There was no decrease in infestation of apricot trees sprayed with winter oils for two years.

Catches of *T. excessana* in traps baited with a fermenting solution of brown sugar in 1935–36 showed that the moths of the overwintered

brood were most numerous about mid-December. From mid-January to mid-February few moths were caught, but they were present in fairly large numbers in March and early April, and some were taken in May. It is thought that there may be a partial third brood. Losses were said to be heavier in 1934–35 than in any other season, and the mean monthly temperatures in 1934 were above the average in August, September, November and December, and only slightly below it in October. The temperature in November was higher than in any previous season for which data are available. In 1935–36, infestation was not very heavy; temperatures were below the normal in September and November 1935 and slightly above it in October. Readings from a thermograph chart showed that there was no evident correlation between the temperature at 9 p.m. and the catch of moths. Some were taken then when the temperature was between 40 and 50°F., though the largest catches were made at higher temperatures.

The larvae were parasitised by a Tachinid, a Chalcidoid and an Ichneumonid, and the pupae by an Ichneumonid.

Harmologa oblongana, Wlk., was taken in the bait traps, and reared from plum and apricot fruits. There were two flight periods in 1935–36, corresponding generally to those of *T. excessana*. *Ctenopseustis obliquana* was reared from the leaves of privet and apricot, and the fruit of apricot and plum. It was scarce in the bait traps. *T. postvittana* was recorded in small numbers from the bait traps, and was also reared from a larva found in a dead cherry leaf. It is less common in Central Otago than in Nelson, where it is the chief leaf-roller on apple and where the higher temperatures probably suit it better. The bait-trap records for 1935–36 showed that adults of *Cydia pomonella*, L., occurred from early November to late January and were most abundant in the first half of December.

Miller (D.) & Clark (A. F.). **The Establishment of *Rhyssa persuasoria* in New Zealand.**—*N. Z. J. Sci. Tech.* **19** no. 1 pp. 63–64, 1 ref. Wellington, N. Z., June 1937.

Rhyssa persuasoria, L., which was introduced into New Zealand a few years ago for the control of *Sirex noctilio*, F., on pines [*R.A.E.*, A **23** 498], was recovered in the summer of 1936–37 from two districts in the South Island.

Simmonds (H. W.). **Fruit Fly Trapping Experiments.**—*Agric. J. Fiji* **8** no. 3 pp. 13–14. Suva, 1937.

In comparative tests in Fiji, the numbers of *Dacus* (*Chaetodacus*) *passiflorae*, Frogg., caught in traps baited with ammonia and synthetic vanilla [*cf. R.A.E.*, A **20** 156], pollard, and Clensel were 1,066, 344, and 103, respectively, and the percentages of females in each were 90–96, 77–84, and 75–80. The ammonia bait was shown to be only half as attractive without vanilla [*cf.* **23** 54].

Simmonds (H. W.). **Fruit Fly.**—*Agric. J. Fiji* **8** no. 3 p. 23. Suva, 1937.

The Eulophid, *Tetrastichus giffardianus*, Silv., which was introduced into Fiji for the control of fruit-flies [*Dacus* spp.], appears recently to have failed to survive the long period during which the host is almost

absent [*cf. R.A.E.*, A **25** 588]. Another parasite, *Dirhinus* sp., which attacks the pupae of the fruit-flies, was imported from Hawaii in March 1937 and liberated. It should establish itself more easily than the Eulophid, as the author has found that it also parasitises the house-fly. Only one adult emerges from the host puparium.

Opius fijiensis, Fullaway [**24** 768] emerged from 12½ per cent. of the fruit-fly pupae collected on 31st March 1937, and an undetermined Chalcid was bred from the pupae on several occasions.

Simmonds (H. W.). **The Biological Control of the Weed** *Clidemia hirta*, **commonly known in Fiji as " the Curse."**—*Agric. J. Fiji* **8** no. 3 pp. 37–39, 10 refs. Suva, 1937.

An account is given of the introduction and establishment in Fiji of *Liothrips urichi*, Karny, for the control of *Clidemia hirta* [*cf. R.A.E.*, A **25** 323, etc.]. The weed is now unable to compete successfully with other vegetation, and it is thought that a fluctuating balance has been established over most of the infested area, the thrips population being maintained on isolated bushes. A few stands of the weed containing 75 per cent. of dead plants have yet to be replaced with mixed growth, but the change is taking place rapidly and can always be hastened by cutting. Most of these are in areas unfavourable to the thrips and likely to support the weed.

Simmonds (H. W.). **The Giant Toad.**—*Agric. J. Fiji* **8** no. 3 pp. 45–46. Suva, 1937.

Colonies of the toad, *Bufo marinus*, introduced into Fiji for the control of noxious insects and other pests [*R.A.E.*, A **25** 588], have now become established, and the females have spawned. The tadpole stage was completed in about 17 days, and the whole life-cycle occupied not more than 11 months. Supplies of the tadpoles have been distributed to additional islands.

Ruhmann (M. H.). **Report of Provincial Entomologist.**—*Rep. B. C. Dep. Agric.* **31** (1936) pp. P46–P47. Victoria, B.C., 1937.

A further spread of *Cydia* (*Carpocapsa*) *pomonella*, L., on apple is reported from British Colombia during 1936; new infestations were light and occurred in small widely-distributed areas. *Enarmonia* (*Laspeyresia*) *prunivora*, Walsh (lesser apple worm) was unusually abundant in one district, and in another *Taeniothrips inconsequens*, Uzel (pear thrips) damaged 10 acres of pears so severely that the loss was estimated at about 1,000 boxes of fruit. During a thorough inspection of districts formerly infested by *Aonidiella* (*Aspidiotus*) *perniciosa*, Comst., live scales were only found in the Indian Reserve, from which other orchards may be re-infested. In 1935 a dormant oil emulsion containing 4½ per cent. actual oil gave satisfactory control in one trial, but not in a second, of the mealybug (*Pseudococcus* sp.) that attacks apple and cherry in the Kootenays [*R.A.E.*, A **23** 715; **24** 500]. Further tests in 1936 showed that all dormant sprays containing 5 per cent. or more actual oil gave excellent control, and the trees were not reinfested. A spray containing 6 per cent. actual oil is recommended, to be applied before the buds break. The trees should be scraped before application, and a pressure of not less than 350 lb.

should be used. *Sitodiplosis* (*Thecodiplosis*) *mosellana*, Géh., was more abundant than usual on wheat.

Baker (A. D.). **The Pea Moth, *Laspeyresia nigricana* Steph., on the Gaspe Coast.**—*Sci. Agric.* **17** no. 11 pp. 694–702, 4 figs. Ottawa, 1937. (With a Summary in French.)

The main pea-growing areas of the Gaspé peninsula are situated in Gaspé county, but pea growing was taken up in Bonaventure in 1934. Here, losses caused by *Cydia* (*Laspeyresia*) *nigricana*, Steph., were so severe in 1934 and 1935 that the area devoted to peas was greatly reduced in 1936. A few larvae closely resembling those of *C. nigricana* were recovered from vetch at the end of the season. Investigations showed that *C. nigricana* was distributed throughout the pea-growing districts of Bonaventure, but was most prevalent in the sheltered parts 2 or 3 miles inland. The lack of shelter in the coastal areas and in most of Gaspé county probably accounts for its scarcity there. The seasons are usually 10–14 days earlier in Bonaventure than in Gaspé, and plant growth is slow till mid-June.

Observations on the life-history were carried out in a district of Bonaventure during 1936, when the season was later and cooler than the average. Adults were first observed in a garden on 18th July, which was a particularly sunny day, and were prevalent throughout the district two days later. The dull and wet days between 18th and 26th July may have delayed oviposition, as no eggs were observed till the latter date. Hatching began on 2nd August, and the first larvae emerged from the pods during the third week of August, though some were still in them in early October. The larvae develop in about 3 weeks, but may remain in the pod for some time after reaching maturity. Moths were not observed after 15th August, but eggs were apparently laid until this time. Most of the crop was picked and shipped by 1st September, when about 70 per cent. of the larvae were still in the pods. The adults fly weakly and are usually most active after 4 o'clock in the afternoon, particularly on a warm, bright day. Eggs are laid on almost any part of the plant, but the sepals are preferred. About 90 seconds after hatching, the larvae begin moving actively over the plant. The pod is often entered near the back rib. As many as 4 larvae have been observed in a single pod, frequently in very different stages of development. It is practically impossible to detect infested pods by their outward appearance. They are usually infected with fungous growths, the larvae either carrying spores into the pod or opening a channel for them. The emergence hole, which is usually in the side of the pod, and near the free end, is easily observed.

Jones (S. C.). **The Currant and Gooseberry Maggot or Yellow Currant Fly** (*Epochra canadensis*) **Loew.**—*Circ. Oregon agric. Exp. Sta.* no. 121, 11 pp., 8 figs., 10 refs. Corvallis, Ore., March 1937. [Recd. September 1937].

Currants and gooseberries in Oregon are very severely attacked by *Epochra canadensis*, Lw.; *Rhagoletis ribicola*, Doane, which is an important pest of these fruits in Washington, damages them little in Oregon, where it mainly occurs on wild currants in the eastern districts. The adults of both Trypetids are very briefly described. Both have only one generation annually, about ten months being

spent in the pupal stage. The females lay up to 200 eggs and usually deposit only one in each berry. *R. ribicola* emerges later than *E. canadensis*. In the years 1931–1934, inclusive, *E. canadensis* began to emerge on 11th, 7th and 18th April and 29th March, respectively. The peak of emergence was reached in about 12 days, but flies continued to emerge for a month. Oviposition begins about a fortnight after emergence, and the eggs hatch in about 5 days. The larvae complete their development in about 15 days and then leave the berries, either before or after they have fallen, and pupate in débris or at a depth of 1–2½ inches in the soil beneath the bushes.

The most effective method of control is the repeated application of a bait-spray of 2 oz. lead arsenate and 1 U.S. quart molasses in 3 U.S. gals. water. The first spray should be applied as soon as the berries begin to set, or, preferably, within one week after the flies begin to emerge, the time being accurately determined by emergence cages, and subsequent ones at weekly intervals and after rain until a week before harvest. Other measures include running poultry in the plantations directly after harvest, as they destroy infested berries on the ground as well as pupae in the soil, and the frequent cultivation of the soil to expose the pupae. The planting of early varieties and early harvesting reduce infestation. Where there are only a few bushes, they may be protected by being covered with muslin.

CUTRIGHT (C. R.). **Codling Moth Biology and Control Investigations.**—*Bull. Ohio agric. Exp. Sta.* no. 583, 45 pp., 19 figs., 4 refs. Wooster, Ohio, July 1937.

The results are summarised of studies on the bionomics and control of *Cydia* (*Carpocapsa*) *pomonella*, L., on apple in Ohio carried out since 1925. Some of the information has already been noticed [*R.A.E.*, A **18** 550; **21** 230, 333; **24** 90, etc.]. Observations on the life-history of the moth were made in 3 localities. Temperature appears to be the most important meteorological factor; in the south of Ohio higher temperatures cause the development of three broods instead of two, and in the north the second brood may be enlarged. Moths lay more eggs, a larger proportion of which hatches, and greater numbers of the larvae establish themselves in the fruit [**19** 342]. A correlation of records showed that control was always better in years when the temperature in late May and June was below normal. Some evidence is given that low humidity and rapid evaporation may be correlated with severe infestation. Special investigations showed that the emergence of the moths started earlier and was more prolonged in the orchard than in cages, but the first peaks in both roughly coincided so that the dates of the first sprays would be the same on whichever basis they were deduced [*cf.* **20** 320]. In a hot dry season injuries appear early and increase rapidly, while in a cool wet season injury is late and accumulates slowly. The relationship between the type of coverage of the ground under the trees, the number of larvae seeking the trunk for hibernation and the final disposition of all the larvae hatching on selected trees was investigated. For the five-year period from 1927 to 1931, 28 per cent. of mature larvae were trapped in the bands on these trees, and 64 per cent. were not recovered at all; possibly some of the latter were eaten by birds, ants, etc. The average percentage of larvae that descended the tree trunk to pupate was greater than that

of larvae that approached it from the ground. Fruit was successfully entered by 87 per cent. of the larvae attacking it, and most of the larvae that penetrated the fruit matured. When dropped apples were removed at intervals of 2 days, 58 per cent. of the larvae had already matured and left them. The coverage on the ground was found to influence only slightly the ability of the larvae to reach the tree-trunk.

Recommendations are given on spray application as well as the results of tests on the use of spreading and sticking agents with lead arsenate and of substitutes for it. Arsenates not containing lead were less effective than lead arsenate; natural cryolite (the best of the fluorine sprays) was fairly effective when used with summer oil, but it gave an excessive residue if employed after the second cover spray. Nicotine sprays were effective against *Cydia* but not against apple maggot [*Rhagoletis pomonella*, Walsh] and were more expensive than lead arsenate. Thiodiphenylamine (phenothiazine) does not appear to be effective in this region.

Smith (L. M.). **Control of the Mealy Plum Aphid.**—*Bull. Calif. agric. Exp. Sta.* no. 606, 34 pp., 12 figs., 2 refs. Berkeley, Calif., April 1937. [Recd. September 1937.]

The bionomics of *Hyalopterus arundinis*, F. (*pruni*, F.) in California, where its only primary food-plants are blue plums and prunes (varieties of *Prunus domestica*), are briefly reviewed [*cf. R.A.E.*, A **25** 316, 517], and an account is given of the amount of injury resulting from infestation and of experiments on control, which were carried out from 1928 to 1935, inclusive. The following is substantially the author's summary: The injury produced consists of curling and stunting of the foliage, lessened growth of new wood, soiling of the bloom of plums, and splitting of the fruit. Elimination of all secondary food-plants within 4 miles of an orchard gave no control, and it was subsequently found that the Aphids can migrate for distances of 20–30 miles in numbers sufficient to cause heavy infestation of large acreages of plums. Defoliation in the autumn with leaf-killing sprays of sodium nitrate was found to be unreliable and dangerous to the tree.

Single sprays of petroleum oil or soap, with or without nicotine, applied during the autumn, winter and spring, failed to produce a satisfactory control. Tests of multiple applications of petroleum oil or soap indicated that as many as 3 fail to give a complete kill. Earlier applications of spring sprays gave better results than later spring sprays, and spring sprays were more efficient than autumn sprays. The addition of nicotine increased the control to such an extent as to justify its use on a cost basis. Laboratory tests of petroleum oil showed a low kill of eggs, as was likewise the case in the field. Viscosity and unsulphonatable residue were not related to toxicity. Miscible petroleum oil emulsions were not more toxic than paste types. An increase of petroleum oil in the diluted spray resulted in an increase in kill of eggs. Of several materials added to petroleum oil, dinitro-ortho-cresol, a coal-tar product, gave by far the greatest increase in toxicity. A laboratory test of coal-tar distillate emulsion gave a high kill of eggs.

Field tests of winter applications of coal-tar distillate in comparison with spring applications of oil and nicotine showed a greater efficiency for tar-distillate. Tests in the dormant period with 5 miscible and 5

paste-type tar-distillate emulsions showed that the paste-type is more efficient, and this was corroborated by laboratory tests. Field tests of tar distillate at 5 concentrations ranging from 0·5 to 4·0 per cent. indicated that 1·5 per cent. gives a good control when spraying is very efficient, and that 2 per cent. is necessary when it is mediocre. No injury was done to the trees by tar-distillate sprays in any of the experiments reported. Increased tree growth follows an application of these sprays and is believed to be the result of the absence of Aphids. A method of deciding whether or not to spray is discussed ; it is based on surveys in autumn, when only a few of the leaves are still green and the Aphids are concentrated on them.

Snelling (R. O.) & Dahms (R. G.). **Resistant Varieties of Sorghum and Corn in Relation to Chinch Bug Control in Oklahoma.**—*Bull. Okla. agric. Exp. Sta.* no. 232, 22 pp., 9 figs., 3 refs. Stillwater, Okla., July 1937.

The following is taken from the authors' summary of this paper, which contains several tables showing the results of tests carried out from 1930 to 1936, inclusive, on the resistance of varieties of *Sorghum* and maize to infestation by the chinch bug [*Blissus leucopterus*, Say] in Oklahoma This Lygaeid is an important limiting factor in the production of maize and *Sorghum* throughout a wide belt of territory extending diagonally across Oklahoma from the north-east to the south-west. Control by means advocated in other States is not always successful, owing to the different climatic conditions, which favour migration of the insect from small grains to maize and *Sorghum* by flight rather than by crawling [*cf. R.A.E.*, A **25** 35]. The use of barriers for preventing damage to these crops is therefore not recommended in the south-western districts. High temperatures and wind render the creosote line ineffective, decreasing its repellent action and bridging the line with litter and soil. The creosote barrier has, however, been used successfully elsewhere in the State. Burning grasses in the winter is not recommended because it does not destroy the bugs hibernating in *Sorghum* stubble, increases soil erosion, is unfavourable to wild life, and destroys winter pasture. The use of immune (leguminous) crops is limited because of unfavourable soil and climatic conditions in many parts of the State where the bug is a problem.

The most promising method for reducing infestation is the use of resistant varieties adapted to the parts of the State where severe damage frequently occurs. The adaptation of a variety of maize to conditions in Oklahoma is an important factor in resistance. One variety was more dependable than all others tested and is particularly recommended for the western districts. Hybrid strains were less severely attacked than their inbred parents. *Sorghum* varieties differ greatly in resistance to drought and infestation. One variety is highly resistant to both, and is well adapted to conditions in Oklahoma. The Lygaeid attacks *Sorghum* during any part of the vegetative period, but older and less tender plants are better able to withstand attack. Those in the earlier plantings are well grown when the bugs migrate to the fields and therefore show less injury and yield heavier crops. Late plantings are frequently destroyed. In areas of the State where infestation does not occur, the highest yields are often obtained from plantings that are made relatively late.

Cotton (R. T.) & Good (N. E.). **Annotated List of the Insects and Mites associated with stored Grain and Cereal Products, and of their Arthropod Parasites and Predators.**—*Misc. Publ. U.S. Dep. Agric.* no. 258, 81 pp., 221 refs. Washington, D.C., July 1937.

It has been conservatively estimated that the damage caused by insects to stored grain and cereal products in the United States amounts to at least £60,000,000 annually. This work comprises two lists, the first of which shows the food habits, distribution and relative importance of all the insects and mites known or reported to be associated with stored grain or cereal products throughout the world. They are divided into four groups, *viz.*, 10 major pests, 41 minor pests, 142 incidental pests, and 143 insects and other Arthropods associated with the pests, chiefly as parasites or predators. In these groups, the orders are arranged systematically, and the genera and species alphabetically within them.

The second is a systematic list and includes the names and synonyms under which each species has been referred to in economic literature for the last 50 years. Appended are an index and a bibliography, which is restricted to the more important references relating to the incidental pests and associated Arthropods.

Goff (C. C.) & Wilson (J. W.). **The Pepper Weevil.**—*Bull. Fla agric. Exp. Sta.* no. 310, 12 pp., 3 figs., 4 refs. Gainesville, Fla, May 1937.

In 1935, *Anthonomus eugenii*, Cano, was found to have caused severe damage to peppers [*Capsicum*] in one locality in south-west Florida [*R.A.E.*, A **24** 363] and was said to have caused similar injury in previous years. In spite of the destruction of almost all the infested pepper plants, there was a heavy infestation in some fields in early 1937. In Florida, peppers are most susceptible in the winter and early spring, when rainfall is lightest.

All stages of the weevil are briefly described. Oviposition took place about 4 days after emergence ; on an average, 198 eggs were laid in an oviposition period of 30 days in the unopened buds or in the fruit. This is fewer than in California [**23** 109], but the average number of eggs laid per day was considerably greater. Weevils did not oviposit at a temperature of 42°F., and eggs kept at this temperature had not hatched in 26 days. The egg stage lasted 2½–3 days in June. Larval and pupal periods lasted 6–9 and 4 days, respectively. Adults lived for more than 3 months when fed on pepper pods, but only survived for a few days without food. The weevil has not been found infesting wild plants in Florida, and of a large number of buds of egg-plants on which adults were feeding, only two were infested. Females already producing eggs fed on fruit and buds of wild nightshade (*Solanum gracile*) and egg-plant, but did not oviposit ; they resumed oviposition when returned to pepper. The appearance of the weevil in three widely separated fields in the spring of 1936 after the stringent destruction of pepper plants seems to show that some alternative food-plants exist, but these must have been either few or unfavourable, as the fields were only lightly infested. Excellent control was obtained in May, June and part of July by picking up fallen fruits and dusting with calcium arsenate, both at frequent intervals, but in late July and August the fruits were not picked up and infestation gradually became

severe, though dusting was continued. Effective and cheap control is given by destruction of all the plants as soon as the peppers have been harvested, but this measure is useless unless all the fields in the district are subject to it.

TATE (H. D.) & POOR (M. E.). **Gladiolus Insects in Iowa.**—*Bull. Iowa agric. Exp. Sta.* no. 359, 20 pp., 19 figs., 7 refs. Ames, Iowa, May 1937.

A brief survey is given of the insects that attack *Gladiolus* in Iowa, the most important of which are *Taeniothrips simplex*, Morison, *Anuraphis* (*Aphis*) *tulipae*, Boy., and *Pseudococcus maritimus*, Ehrh. Measures against *T. simplex* [*cf. R.A.E.*, A **23** 757, etc.] are discussed in some detail; for its control in the field a spray of 1 oz. Paris green, 1½ U.S. pints hydrol and 3 U.S. gals. water has proved satisfactory. Hydrol is a by-product of the maize syrup industry and costs about a quarter as much as brown sugar. The other two species, which infest the corms in the field and overwinter on them in storage, may be controlled by the fumigants used against *Taeniothrips* or by submerging the corms for 2–3 hours at 90–100°F. in a dip of 1 oz. 40 per cent. nicotine sulphate, 6 oz. soap and 10 U.S. gals. water.

WAKELAND (C.). **Entomology.**—*Bull. Idaho agric. Exp. Sta.* no. 221, pp. 30–33, 1 fig. Moscow, Idaho, June 1937.

Ascogaster carpocapsae, Vier., *Prospaltella perniciosi*, Tower, and *Aphelinus mali*, Hald., parasitic, respectively, on the codling moth [*Cydia pomonella*, L.], the San José scale [*Aonidiella perniciosa*, Comst.] and the woolly aphis [*Eriosoma lanigerum*, Hsm.], were all found to be established in 1936 in an experimental apple orchard [into which they had been introduced in 1935]. The percentage parasitism by *Ascogaster* increased from 7·2 in the over-wintering generation to 43·9 at the end of the first brood. *Aonidiella perniciosa* was also parasitised by greatly increased numbers of a native species, *Aphytis mytilaspidis*, LeB. Infestation of ears of maize by the corn earworm [*Heliothis armigera*, Hb.] was 72 per cent. on untreated plots and 49·6 per cent. on those where the silks were dusted with Alorco cryolite [*R.A.E.*, A **24** 297] twice with an 11-day interval.

Experiments on the control of the pea Bruchid [*Bruchus pisorum*, L.] showed that about 99 per cent. of the peas were free from infestation after dusting with a mixture of derris and tobacco, and that cryolite and mixtures of derris and sulphur or diatomaceous earth were also effective. Calcium arsenate was the least efficient of the dusts tested. Only 0·2 per cent. of the Bruchids emerged from peas buried at a depth of 6 inches in the soil, but more emerged from peas at a depth of 2 inches than from those on the surface and exposed to the sun. Border trap crops did not prove effective [*cf.* **24** 293] as the fields were infested by Bruchids migrating from hibernation quarters after the border plants were ploughed in. Ten shipments of the Braconid parasite, *Triaspis thoracicus*, Say, were received and 21,002 individuals released.

MASON (T. G.) & PHILLIS (E.). **A Note on a new Method of Control for Insect Pests of the Cotton Plant.**—*Emp. Cott. Gr. Rev.* **14** no. 4 pp. 308–309, 2 refs. London, October 1937.

In view of the observation that selenium in plants is toxic to insects while relatively harmless to the plants [*cf. R.A.E.*, A **24** 768],

experiments were carried out in Trinidad on its application to cotton. Plants of Sea Island cotton in sand-culture were given nutrient solutions containing selenium at the rate of 5, 10, 20 and 50 parts per mille, respectively, in the form of sodium selenate. All groups flowered and ripened bolls, but growth was affected in the last two. Aphids were numerous on control plants, but only a few adults were observed on treated ones, and breeding was inhibited. Nymphs of *Dysdercus howardi*, Ballou, in the fourth and fifth instars fed on the green bolls all died on the 10, 20 and 50 groups and suffered 60 per cent. mortality in 3 weeks on the 5 group. No mortality was observed in the controls. Adults paired on the first three groups, but eggs were observed only on the first. An experiment in which nymphs were fed on the seed of the 20 group showed that the stainers developed resistance with increasing development. Selenised cotton plants in sand-culture adjoining a cotton-field became heavily populated with stainers when the field plants were cut, and a high rate of mortality was observed. Females of the pink bollworm [*Platyedra gossypiella*, Saund.] oviposited indiscriminately on control and selenised plants, but plants exposed to attack showed 39 per cent. damaged loculi in the controls and 16, 7, 7 and 4 per cent., respectively, in the treated groups. Mortality in the selenised bolls appeared considerable.

South Africa. **Agricultural Pests Act (Act No. 11 of 1911, as amended), Agricultural Pests (Citrus Canker) Act (Act No. 10 of 1919) and Psorosis Act (Act No. 42 of 1927). Proclamations, Government Notices and Regulations.**—Med. 8vo., 54 pp. Pretoria, Dep. Agric. For., 1937.

This pamphlet includes the text of the Agricultural Pests Act of 1911 as amended by the Agricultural Pests Amendments Acts of 1922, 1924, 1933 and 1934 [*R.A.E.*, A **22** 710], together with the texts of proclamations modifying the restrictions on the movement of plants into and within the Union of South Africa, a list of plants so restricted, and the text of regulations concerning nurseries [*cf. loc. cit.*].

Mamet (R.). **New Species of Coccidae (Hemipt. Homopt.) from Mauritius.**—*Proc. R. ent. Soc. Lond.* (B) **6** pt. 9 pp. 173–176, 3 figs. London, 15th September 1937.

The three new Coccids described include *Lepidosaphes vermiculus*, which was found on the leaves of coconut and was heavily parasitised, probably by *Aspidiotiphagus citrinus*, Crwf.

Frappa (C.). **Les insectes nuisibles à la canne à sucre à Madagascar.**—*Bull. écon. Madagascar* N.S. no. 3 pp. 221–230, 10 refs. Tananarive, 1935. [Recd. October 1937.]

The roots and collar of sugar-cane in Madagascar are attacked by the Dynastid, *Heteronychus plebejus*, Klug [*cf. R.A.E.*, A **18** 103], and the Melolonthid, *Hoplochelus rhizotrogoides*, Blanch., the adults of both of which are described. After pairing in the soil in December–January, females of *H. plebejus* leave the damp places that are their preferred habitat and oviposit in manure or decaying vegetable matter, in

which the larvae develop. Adults occur in the cane-fields from October or November to the end of July, mostly in damp soil, but also on the surface, and attack the tender underground parts of shoots, so that the leaves turn yellow and die. The adults of *H. rhizotrogoides*, which was not recorded as a pest in Madagascar until 1931, occur in swarms for a short period in September–November and apparently oviposit in the soil at the base of canes from October to February. The larvae attack the roots and cause yellowing of the plants, sometimes infesting 20 per cent. of them.

The canes are attacked by the moth borers, *Diatraea venosata*, Wlk. (*striatalis*, Sn.) and *Sesamia vuteria*, Stoll, all stages of which are briefly described. A fertilised female of *D. venosata* deposits 125–200 eggs in batches of about 20 on the leaves. The larvae hatch in 7–9 days and, having spun a larval shelter and fed on the parenchyma, bore into the stems. When full-fed, they make their way out and pupate under the shelter of the dry leaves at the base of the plant. The pupal stage lasts 12–25 days in the hot season. *S. vuteria*, the world distribution of which is indicated, deposits 2–3 batches of 12–70 eggs on the stems and leaves of grasses, and the larvae bore in the stems until they reach the last instar. They then migrate to sugar-cane or maize, in which they feed and bore a pupal chamber. The egg, larval and pupal stages last 8–10, 35–40 and 12–15 days, respectively. The canes are often killed by the attack. The loss caused by these borers, though sometimes estimated at 50–60 per cent. damaged canes, is probably about 3–10 per cent. of the sugar crop. Among several Hymenopterous parasites, a species of *Trichogramma*, possibly *T. australicum*, Gir., has been bred from eggs of both borers, and several species of *Ophion* parasitise the larvae. *Sphex torridus*, Smith, is predacious on the larvae.

Pests of the leaves include *Locusta migratoria capito*, Sauss. [*cf.* **22** 8], *Trionymus sacchari*, Ckll., which occurs in the north and on the plateaux, and weevils, of which the most important is *Stiamus brachyurus*, Pasc.

FRAPPA (C.). **Note sur deux nouvelles chenilles nuisibles au cotonnier à Madagascar.**—*Bull. écon. Madagascar* N.S. no. 7 pp. 284–286, 14 refs. Tananarive, 1936. [Recd. October 1937.]

In 1934, larvae of the Noctuids, *Cosmophila flava*, F. (*erosa*, auct.) and *Acontia* (*Xanthodes*) *graellsi*, Feisth., were found feeding on the leaves of cotton in Madagascar. Females of *C. flava* oviposit preferably on the lower but also on the upper side of the leaves of Malvaceae, including cotton, and the larvae prefer large leaves for feeding. The larval and pupal stages last 24–25 and 5–6 days, respectively. Observations on the bionomics of *A. graellsi* in the Transvaal [*R.A.E.*, A **18** 420] are summarised.

FRAPPA (C.). **Les plantes à roténone. Leur intérêt à Madagascar comme insecticide.**—*Bull. écon. Madagascar* N.S. no. 9 pp. 61–71, 19 refs. Tananarive, 1937.

This paper comprises a survey from the literature of the chemistry and insecticidal properties of rotenone, and the distribution and characteristics of the plants from which it can be obtained, with special mention of those that occur in Madagascar.

Frappa (C.). **Le sphinx des feuilles du caféier à Madagascar.**—*Bull. écon. Madagascar* N.S. no. 9 pp. 72–74, 10 refs. Tananarive, 1937; also in *Rev. Path. veg.* **24** fasc. 3–4 pp. 318–323. Paris, 1937.

Since 1934, larvae of *Cephonodes hylas*, L., have been observed feeding on the leaves of coffee in several districts of Madagascar. All stages of this Sphingid are described, and notes are given on its world distribution. The eggs are deposited singly on the upper sides of the leaves, and larvae are present throughout the hot season. In 1937, the pupal stage, which is passed in the soil at the foot of the food-plant, lasted from 5th February to 8th March at Tananarive, and on the plateaux there are probably two generations a year.

Schüssler (H.). **Wilde Seidenspinner.** [Wild Silk Spinners.]—*Tropenpflanzer* **40** no. 10 pp. 411–432, 16 refs. Berlin, October 1937.

This is an annotated list of 75 Lepidoptera and 2 spiders that produce silks, some of which are of commercial value.

Meyrick (E.). **Exotic Microlepidoptera, 5, pt. 4.**—pp. 97–128. Marlborough, Wilts, the author, August 1937. Price 3*s*. per part.

The new species described include *Acrocercops chalybophanes* from coffee (*Coffea arabica*) in Tanganyika, *Fumaria* (*Fumea*) *pinicola* from *Pinus patula* in the Transvaal, and *Brenthia dendronympha* from *Shorea robusta* in the United Provinces, India.

Smith (K. M.). **A Textbook of Plant Virus Diseases.**—Demy 8vo, x + 615 pp., 1 pl., 101 figs., many refs. London, J. & A. Churchill Ltd., 1937. Price 21*s*.

By the classification adopted in this textbook, the viruses that are chiefly associated with a particular plant are grouped together and differentiated by numbers, the synonyms of each being given. The viruses are placed in the order of their plant-hosts; first the properties and modes of transmission (including transmission by insect vectors) of the virus are discussed, and then the diseases caused by it, arranged in order of their plant-hosts, are described. In an appendix, the common symptoms of each virus disease of each plant are listed under the scientific name of the plant, together with the virus that causes it and a page reference. The insect vectors are dealt with in some detail in a separate section. A description is given of each insect, together with an account of its life-history and distribution, and lists of its food-plants and the viruses it transmits. Aphids are numerically the most important insect vectors of plant viruses; *Myzus persicae*, Sulz., is associated with 21.

Heinze (K.). **Zur Frage der Uebertragung der Kartoffelvirosen durch Jassiden.** [On the Question of the Transmission of Potato Viruses by Jassids.]—*Phytopath. Z.* **10** no. 6 pp. 606–613 1 graph, 4 figs., 4 refs. Berlin, 1937.

Investigations in Germany in 1936–37 showed that the Jassids, *Eupteryx atropunctata*, Goeze, and *Empoasca* (*Chlorita*) *flavescens*, F.,

which are common on potato, did not transmit potato viruses, though attack by them caused a rolling of the leaves similar in appearance to that due to the virus of leaf-roll.

EICHLER (W.). **Vogelnester und Vorratsschädlinge.** [Birds' Nests and Pests of Stored Products.]—*Mitt. Ges. Vorratsschutz* **13** nos. 4–5 pp. 42–49, 61–64, 30 refs. Berlin, July–September 1937. (With a Summary in English.)

A list is given from the literature of pests found in birds' nests, particularly insects and mites that are liable to injure stored products.

MARCUS (B. A.). **Ueber die Wirkung von Kontaktbestäubungsmitteln auf Bienen im Freiland.** [On the Action of Contact Dust Insecticides on Bees in the Open.]—*Anz. Schädlingsk.* **13** no. 10 pp. 118–121, 17 refs. Berlin, 15th October 1937.

To prevent the destruction of bees by the arsenical dusts formerly used against forest pests in Germany, it was considered necessary to remove hives to a distance of at least 3½ miles from the area to be treated. In laboratory experiments, contact dusts are also harmful to bees, but in the course of actual work against forest pests in Bavaria in 1936 with Forestit [*R.A.E.*, A **20** 314] and Detal [**24** 517], which is a dinitro preparation, no mortality among bees was observed, although many hives had not been removed. In 1937, Forestit and a similar poison, Neurotol, were used without removal of the hives and no harm to bees resulted. Suggested reasons are that bees are not active in the early morning and late evening, when dusting is usually carried out, and therefore do not come into direct contact with the dust cloud, as they do in laboratory tests, that they seldom enter the forest itself, that the contact poisons soon lose their toxicity, and that in nature bees avoid the poison on becoming aware of it.

VANDENBRANDE (J.). [**Measures against** *Dasychira pudibunda* **in Belgium.**]—*Bull. Soc. ent. Belg.* **77** no. 7–8 pp. 318–320. Brussels, August 1937.

An account is given of measures employed in 1936 against larvae of *Dasychira pudibunda*, L., which infested about 17,300 acres in two forest regions in Belgium. Beech and bilberry [*Vaccinium myrtillus*], hazel, and oak and maple were attacked in that order of preference, and trees round clearings were most damaged. About 3,700 acres of forest were dusted with calcium arsenate from different sources. Weather conditions were unfavourable, but application in slight rain did not seem to decrease the effectiveness of the insecticide. The different calcium arsenates showed some differences in effectiveness, but on an average they were estimated to have killed about 1,000,000 larvae per acre, while 80,000 per acre died in untreated areas. The treatments arrested defoliation, which was complete in some of the untreated districts, though the larvae in the latter died off rapidly in the autumn owing to parasitism and unfavourable weather. No mortality was observed among game as a result of the dusting, and no trace of arsenic was found in water from the streams running through the woods.

W. E. van den Bruel examined larvae of *D. pudibunda* from treated and untreated areas of the forest and established that they were attacked by polyhedral disease, which, late in the season, probably caused more mortality than parasites or predators.

FAES (H.). **Switzerland : Outbreak of the Colorado Potato Beetle, *Leptinotarsa decemlineata*, in the Country.**—*Int. Bull. Pl. Prot.* **11** no. 9 pp. 200M–201M. Rome, September 1937.

The occurrence in Switzerland since mid-June 1937 of over 200 small infestations of potato by *Leptinotarsa decemlineata*, Say, is noted [*cf. R.A.E.*, A **25** 764], and the Federal Organisation set up to supervise measures for its control is briefly described. It has been definitely established that *L. decemlineata* had not entered Switzerland at the end of 1936. The measures adopted in the Canton of Vaud are summarised.

COSTANTINO (G.). **Le fumigazioni cianidriche degli agrumeti.** [Hydrocyanic Acid Gas Fumigation of *Citrus* Plantations.]—*Boll. Staz. Frutt. Agrum. Acireale* no. 66, 100 pp., 67 figs., 70 refs. Acireale, 1937.

This is a compilation of instructions and technical data on the tent fumigation of *Citrus* with hydrocyanic acid gas and is intended for the use of instructors and of the foremen and staff engaged in this work. Details are given of the various ways in which the gas is generated and of the apparatus required, and of the climatic and other factors needing consideration. Notes on the bionomics of the Coccids that infest *Citrus* in Italy, especially Calabria and Sicily, are included.

COSTANTINO (G.). **Un insetto dannoso alla vite : il *Labidostomis taxicornis* Fabricius (volg. Fetula, Fitulina, Addinedda, Jaddinedda).** [*L. taxicornis*, an Insect harmful to the Grape-vine.]—*Boll. Staz. Frutt. Agrum. Acireale* no. 67, 4 pp., 2 figs., 11 refs. Acireale, 1937.

In April 1936 and 1937, grape vines in Sicily were injured by adults of *Labidostomis taxicornis*, F., which attacked the newly opened shoots and leaves but disappeared in about a fortnight after pairing and ovipositing. The larvae live in ants' nests, feeding on the stores accumulated there. This Clytrid is very common in Sicily, but does not appear to have been recorded from grape-vines since 1914. The measures advised are the application to the foliage of a 1 per cent. lead arsenate spray, or collection of the adults by shaking the plants before sunrise.

ISAAKIDÈS (C. A.). **Liste II des insectes et autres animaux nuisibles aux plantes cultivées et des insectes auxiliaires de la Grèce.**—*Ann. Inst. phytopath. Benaki* **2** fasc. 1 pp. 5–7. Athens, 1936. [Recd. September 1937.]

This supplementary list [*cf. R.A.E.*, A **24** 611], which is compiled from material examined during 1934 and 1935, comprises 36 injurious insects and 2 mites and shows the plants or products they attacked and the places in which they were taken.

Isaakidès (C. A.). **L'*Eumarchalia* (*Schizomyia*) *gennadii* (P. Marchal) en Crète.**—*Ann. Inst. phytopath. Benaki* **2** fasc. 1 pp. 17–25, 2 pls. Athens, 1936. [Recd. September 1937.]

The Cecidomyiid, *Eumarchalia* (*Asphondylia*) *gennadii*, Marchal, is a serious pest of carob [*Ceratonia siliqua*] in Crete. The literature on the subject is briefly reviewed and the habits of growth, etc., of the carob tree are described. Trees in damp soil produce black fruits, long and thick, containing 40 per cent. sugar, and have a longer flowering period than those on dry ground, which produce shorter fruits, curved and thin, containing 48 per cent. sugar. Those on damp ground are most frequently attacked by *E. gennadii*. Fruits that are not killed by attack are deformed and brown in colour, and are not harvested; about 10 per cent. of the fruits in one district were so affected. Both fertilised and unfertilised fruits are attacked when scarcely 7 mm. long and the former wither before reaching a length of 4–5 cm. From observations on the emergence of *E. gennadii* from carobs received from Crete, it was concluded that very young fruits are attacked in July and that adults emerge in mid-August to oviposit on the half-grown fruits. The number of generations between August and the winter is uncertain. Adults are again abundant in May and early June, and larvae, evident in June, give rise to adults in July. In Crete it was observed that damage by this Cecidomyiid was less important in localities exposed to wind. Pruning and thinning the foliage appeared to reduce damage; treatment should be repeated every 2–3 years. This procedure, however, is expensive for general application.

Eurytoma dentata, Mayr, *Eupelmus urozonus*, Dalm., *Tetrastichus flavovarius*, Nees, and *Dinarmus* sp. were all reared from carobs in association with *Eumarchalia*.

Isaakidès (C. A.). **La puissance attractive de la mélasse pour la mouche des olives.**—*Ann. Inst. phytopath. Benaki* **2** fasc. 1 pp. 26–34, 2 refs. Athens, 1936. [Recd. September 1937.]

Bait-sprays containing sodium arsenite and molasses have been used for a number of years against the olive fly [*Dacus oleae*, Gmel.] in Greece [*cf. R.A.E.*, A **10** 3], but only in some cases have the results been satisfactory. Experience suggests that the most effective sprays are those that give off a smell of liquorice and that adhere to the trees for a long time because the molasses is viscous. Sugar-cane molasses from Egypt was found to have this smell and to be more viscous than beet molasses, but the study here described shows that there are considerable differences in the composition and characteristics of samples from different Egyptian factories.

[Polizu (S.).] **Полизо (С.). Certain Questions in Connection with the Vine Mite.** [*In Russian.*]—*Bessarabsk. s.-kh. Vyestn.* 1937 no. 1–2 pp. 13–16. Chişinău, May 1937.

An account is given of the bionomics of the red spider [*Tetranychus telarius*, L.] on vine in Bessarabia [*cf. R.A.E.*, A **22** 230; **23** 230], together with notes on the character of the damage caused and the resistance of different varieties of vine to infestation. Natural enemies include *Scolothrips sexmaculatus*, Perg., *Chrysopa vulgaris*, Schn., *C. perla*, L., and Staphylinids. In field experiments in 1935,

spraying with lime-sulphur (1 lb. sulphur, 1 lb. quicklime and 10 gals. water) killed practically all the mites ; only young shoots were scorched, and the spray continued to be effective for a long period after its application. Very good results were also obtained with a spray of 2 oz. potassium permanganate and 3 lb. quicklime in 10 gals. water. Spraying with a mixture of soft soap and either tobacco decoction or sulphur, or dusting with sulphur, was ineffective.

Nowicki (S.). **Nouveaux courants dans l'écologie des insectes nuisibles.** [*In Polish.*]—*Las Polski* **12** no. 1 pp. 24–37, 4 graphs, 10 refs. Warsaw, 1937.

The author reviews the results obtained in recent years by various workers on the correlation of abiotic factors, particularly climate, with the occurrence of outbreaks of insects. The importance of temperature and humidity and the possibility of predicting a change in the population of an insect by studying these factors is discussed. The use of the Ball-Taylor climatograph or the Uvarov bioclimatograph [*cf. R.A.E.*, A **20** 548] for the comparative analysis of environmental conditions is outlined, and an account is given of Uvarov's studies on *Dociostaurus maroccanus*, Thnb. [*loc. cit.*] as an instance of the practical application of ecological methods.

Obarski (J.). **The Enemies of Tobacco Plants and their Control.** [*In Polish.*]—*Publ. Cultiv. Ferment. Tobacco Pl.* (B) no. 3, 76 pp., 41 figs., 20 refs. Warsaw, 1937. (With a Summary in English.)

This manual on pests of tobacco occurring in Poland begins with general notes on their control by means of agricultural, mechanical and chemical measures, and a key for their determination in the stages in which they attack the plants, based on the morphological characters and the injury caused. A section of 40 pages (pp. 33–72) deals with insect pests, which comprise about 40 species arranged under their orders. The adults, or in some cases all stages, are described, and notes are given on bionomics, damage caused and control. An index to the pests is appended.

Gilyarov (M. S.).] **Гиляров (М. С.). Factors determining the Injuriousness of Soil Pests and their Significance for the Cultivation of Rubber-producing Plants.** [*In Russian.*]—*Plant Prot.* fasc. 13 pp. 41–53, 33 refs. Leningrad, 1937. (With a Summary in English.)

In southern Ukraine the rubber-producing plants, *Scorzonera tausaghyz* and *Taraxacum kok-saghyz*, are attacked by a number of Coleopterous larvae that occur in the soil, including the Elaterids, *Agriotes sputator*, L., and *A. gurgistanus*, Fald., the Cistelids, *Omophlus lepturoides*, F., *O. proteus*, Kirsch, and *Podonta daghestanica*, Reitt., the Tenebrionid, *Opatrum sabulosum*, L., and the Lamellicorns, *Anisoplia austriaca*, Hbst., *A. segetum*, Hbst., *Amphimallus solstitialis*, L., and *Pentodon idiota*, Hbst. Experiments with most of these larvae were carried out in 1934 and 1935 and showed that the injury they cause is inversely proportionate to the humidity of the soil and its content of humus and decaying vegetable matter. They attack plants to obtain food if the soil is poor or moisture if it is rich but dry. The degree to which the larvae can subsist on humus alone varies, however, with the species.

[Zimin (G. S.).] **Зимин (Г. С.). A new Method of Pasting** *Sitotroga cerealella* **Eggs for Laboratory Propagation of** *Trichogramma evanescens*. [*In Russian.*]—*Plant Prot.* fasc. 13 pp. 53–56, 3 refs. Leningrad, 1937.

The method described is based on the fact that eggs of *Sitotroga cerealella*, Ol., adhere to glass if it is moistened. Parasitised and blackened eggs of the moth are placed in a test tube, and when mass emergence of *Trichogramma evanescens*, Westw., takes place, fresh eggs of *Sitotroga* are strewn in a single layer over the wet surface of two glass plates roughly 7 ins. square, which are allowed to dry for 15–30 minutes and are then clipped on each side of a wooden frame edged on the inside with a narrow strip of thick velvet. The test-tube with the adult parasites is then inserted into an opening in the side of the frame, which is held upright, and the contents are shaken out. To induce all the parasites to leave the test-tube, it is covered with dark fabric. As the parasites tend to congregate on the glass nearer to the source of light, the frame is turned once a day. The parasitising of the eggs is completed in two days, and the glass plates are then removed from the frame and placed in a stand. When the eggs turn black, they are brushed off, or washed off with water and dried on filter paper, and stored in an ice cellar in match-boxes.

[Grivanov (K. P.).] **Гриванов (К. П.). On the Number of Generations of** *Euxoa segetum* **Schiff. in the southern wooded Steppe of the Ukraine.** [*In Russian.*]—*Plant Prot.* fasc. 13 pp. 56–59, 7 refs. Leningrad, 1937.

It is generally believed that *Euxoa segetum*, Schiff., has two generations a year in the forest steppe zone in southern Ukraine. Field observations in 1936 in the Kharkov region indicated, however, that larvae of a third generation may occur. The first-generation adults appeared on 14th July, and the moths were most numerous between 3rd and 13th August, but single individuals were observed as late as 10th October. This long flight-period suggested the occurrence of second-generation adults, and this was confirmed by the fact that females taken in the second half of September and in October appeared to have recently emerged. A considerable percentage of them had a large fat-body and long egg tubes with eggs in which the yolk was usually just beginning to form, whereas others contained 150–300 mature eggs. Moreover, larvae of the second and third instars, which evidently belonged to the third generation, were found in the soil on 8th October. That a partial third generation of *E. segetum* has frequently occurred in the forest steppe zone since 1911 is indicated by the calculation for each year of the sums of effective temperatures. These also indicated that the third-generation larvae cannot complete their development.

[Gusev (V. I.).] **Гусев (В. И.). Contribution to the Ecology of Bark-borers on the Caucasian Black Sea Coast.** [*In Russian.*]—*Plant Prot.* fasc. 13 pp. 60–68, 3 refs. Leningrad, 1937. (With a Summary in English.)

Records are given of 30 species of bark-beetles found in 1930 in forests and parks in different districts on the Black Sea coast of the Caucasus between Anapa and Gagrui, with notes on the trees attacked,

the parts infested and, in some cases, the galleries. The abundance of bark-beetles on the Black Sea coast is due to the neglected condition of the forests, which are not cleared of débris, wind-broken trees and branches, and felled timber, which is often left unbarked.

[Serdyukov (P.).] **Сердюков (П.). Results of widespread Distribution of *Aphelinus mali* as a Means of Control of *Eriosoma lanigerum* in the North Caucasus.** [*In Russian.*]—*Plant Prot.* fasc. 13 pp. 69–71. Leningrad, 1937.

A brief survey is given of the successful establishment of *Aphelinus mali*, Hald., against the woolly apple aphis [*Eriosoma lanigerum*, Hsm.] in the North Caucasus [*cf. R.A.E.*, A **25** 133, etc.]. Observations have shown that it usually does not prevent the Aphids from becoming abundant in spring, but destroys almost all of them in the course of the summer. As a result, the yield of apples increases by 30 per cent.

[Chernuishev (P. K.).] **Чернышев (П. К.). Forecasting and regional Distribution of Warehouse Pests.** [*In Russian.*]—*Plant Prot.* fasc. 13 pp. 71–73. Leningrad, 1937.

Observations showed that the initial condition of stored grain is the decisive factor that affects the activity of mites infesting it, since they are protected by the layers of grain from the subsequent effects of external temperature and humidity. It is possible, therefore, to forecast the extent of infestation in autumn and winter from data on the ripeness of the grain at the moment of storage and weather conditions at the time of harvest. The mites are usually distributed unevenly in the infested grain, as they concentrate in places in which the grain is moister, is mixed with débris or is decomposing more rapidly. Mites occurring in the drier and cleaner parts of the grain gradually migrate to these damp places, and thus colonies are formed.

[Chugunin (Ya. V.).] **Чугунин (Я. В.). Testing Pyrethrum as a Means of Codling Moth Control.** [*In Russian.*]—*Plant Prot.* fasc. 13 pp. 73–75. Leningrad, 1937.

Successful results against the codling moth [*Cydia pomonella*, L.] on apple were obtained in the Crimea with a single application of a spray of kerosene and pyrethrum powder containing 1·14 per cent. pyrethrum. To prepare it, 5 gals. kerosene was poured over 18 lb. pyrethrum powder and allowed to stand for a fortnight. Immediately before spraying, the mixture was thoroughly stirred and then emulsified with 1,000 parts water, the pyrethrum powder acting as the emulsifier. The spray was applied at the peak of oviposition of the first-generation moths, at which time a few of the eggs were hatching. The average percentage of infested fruits on the sprayed trees was half that on the controls, and was slightly less than that on trees receiving sprays containing 2 or 5 times as much pyrethrum.

[Parfent'ev (V. Ya.).] **Парфентьев (В. Я.). *Zeuzera pyrina* L. in Kamyshin, Saratov Region.** [*In Russian.*]—*Plant Prot.* fasc. 13 pp. 76–80, 7 refs. Leningrad, 1937.

Observations carried out in 1936 in a district on the Volga in the central area of the Province of Saratov showed that the Cossid,

Zeuzera pyrina, L., was the most important of the forest pests occurring there, being very abundant as a result of the neglected condition of the forest [*cf. R.A.E.*, A **25** 7]. Foci of infestation were concentrated in sparse stands with a considerable admixture of the preferred trees, especially in the absence of the undergrowth and on high ground. Ash, elm and apple were chiefly attacked and to a less extent oak and maple, preference being invariably shown for trees with a thin trunk. There are two independent broods of the moth in the district, the adults of which appear in alternate years. Contrary to observations in the Ukraine [*loc. cit.*], the larvae first attack the upper part of the tree, injuring the leaf stems and thin twigs and hibernating in the latter. In the following year they attack thicker branches and the trunk, and concentrate on the lower part of the trunk about 6½–8 ft. from the base when about to pupate.

Other pests that were abundant were *Scolytus multistriatus*, Marsh., on elms and *Agrilus viridis*, L., on birch.

[Pustovoĭt (A. F.).] **Пустовойт (А. Ф.). The Control of *Apion apricans* Hbst. by Means of Ditches.** [*In Russian.*]—*Plant Prot.* fasc. 13 pp. 80–83. Leningrad, 1937.

In the Province of Kalinin, *Apion apricans*, Hbst., sometimes infests 60 per cent. of the flower heads of clover, an average of 2·6 larvae occurring in a flower head. The larvae and pupae complete their development in the clover after it has been mown and stored, and the young adults abandon it at the end of July or beginning of August and migrate to clover that is growing again. Excellent control of the migrating weevils was obtained in 1936 by trapping them in a ditch 16–20 ins. deep, dug at a distance of 3 ft. round a barn in which clover was stored ; the outer wall of the ditch sloped so that the ditch was 6 ins. wide at the top and 12 ins. at the bottom. This prevented the weevils from escaping and also protected the wall from rain. About half a million weevils were caught in a week in about 30 yards of ditch. It was found desirable to cover the bottom of the ditch with a thin layer of fresh clover soaked for 10–15 minutes in an 8 per cent. solution of sodium fluosilicate. This bait killed most of the weevils in the ditch ; it should be renewed every two days.

[Matkovskiĭ (S. T.] **Матковский (С. Т.) New Achievements in the Control of *Bruchus pisorum* L.** [*In Russian.*]—*Plant Prot.* fasc. 13 pp. 83–87. Leningrad, 1937.

In the steppe zone of the Ukraine, peas are so severely infested by *Bruchus pisorum*, L., that from 60 to 97 per cent. of the crop is sometimes damaged, and measures designed to destroy it in the harvested peas have failed to give complete control. An examination in 1934 of peas grown near Odessa and obtained from crops sown on six different dates but maturing at the end of June or the beginning of July showed that at this time the Bruchids in them were in the larval or pupal stage (97·8 and 2·2 per cent., respectively). The young females that emerged from the peas in August had undeveloped ovaries. When peas of the spring crop, some of which were infested, were sown soon after harvest, they yielded a good crop in October and it was completely free from infestation. The author therefore suggests that this Bruchid would be almost eliminated if, for two successive

years, all peas obtained from the first harvest were sown between 20th June and 10th July. It is important that clean fallow land should be used for each crop.

Summaries of the Work of the Section of Plant Protection of the All-Union Institute of Grain Farming (Saratov) for the Year 1936. [*In Russian.*]—*Plant Prot.* fasc. 13 pp. 91–98. Leningrad, 1937.

Of these summaries of unpublished reports by various authors, three are of entomological interest. In The Importance of Pests of Lucerne grown for Seed and their Control (pp. 91–95), D. A. Ponomarenko records investigations in 1936 in the south-east of European Russia, which showed that lucerne was severely damaged by the weevils, *Sitona inops*, Gyll., *S. callosa*, Gyll., *S. longula*, Gyll., and *S. crinita*, Hbst. [*cf. R.A.E.*, A **24** 453], which destroyed young sprouting plants, *Hypera* (*Phytonomus*) sp., which attacked lucerne in the second year of growth, the larvae developing in the flower buds of the spring crop, and *Tychius flavus*, Beck., the larvae of which fed on the seeds in the green pods ; and by larvae of the Eurytomid, *Bruchophagus gibbus*, Boh., which infested the seeds of maturing pods of all ages. The larvae and adults of *Hypera* sp. and adults of *T. flavus* and *Sitona* spp. were successfully controlled by dusting spring lucerne with calcium arsenate at the rate of 13½ lb. per acre before the appearance of the green inflorescences and again at the beginning of flowering. The measures against *B. gibbus* should include the use of uninfested seeds for sowing ; storing infested seeds in sacks of closely woven material, or covering the heap with a layer of uninfested seeds to prevent the newly emerged adults from flying out ; disking in spring fields of lucerne that have produced a crop in the second half of the preceding year, in order to bury the fallen pods and seeds and thus prevent the emergence of the young adults ; mowing lucerne at the beginning of flowering to prevent the development of the green pods ; removing all chaff, straw, fallen seeds, etc., after threshing ; and periodically mowing wild lucerne for hay, or grazing cattle on it.

In The principal Conclusions from a Study of Wireworms in the Department of West Kazakstan (pp. 95–96), S. A. Pilyugina states that *Agriotes lineatus*, L., and *Corymbites latus*, F., are the most important pests of sprouting summer wheat. The dry weather in 1936 was unfavourable for their development, only a small number of adults emerging from hibernation and 11 per cent. of the larvae collected during the summer being dried up in the upper layer of the soil. Wheat on irrigated land was, however, considerably less infested than that grown without irrigation. Wireworms were especially abundant in fallow land overgrown with *Agropyrum ramosum*, *Artemisia* or *Bromus secalinus*, their numbers increasing with the age of the fallow. Summer wheat was much more infested when sown on such land than when on land that had been used for lucerne.

In Results of Investigations on the insecticidal Properties of Magnesium Arsenite (p. 97), E. Kokina & D. Dobromuislov report an attempt made, in view of the high cost of arsenic in Russia, to substitute a magnesium arsenite containing about 25 per cent. As_2O_3 for the standard calcium arsenite containing 71 per cent. In preliminary tests, the magnesium arsenite gave almost the same rate of mortality

of Acridids as calcium arsenite ; and in experiments in which it was applied as a dust from an aeroplane in southern Kazakstan against the Asiatic locust [*Locusta migratoria*, L.] and in the steppes of the Department of Saratov against the Italian locust [*Calliptamus italicus*, L.], it proved effective, though 25 per cent. less toxic than the standard calcium arsenite. When used at the rate of $4\frac{1}{2}$–$13\frac{1}{2}$ lb. per acre, it did not scorch plants.

BALLARD (E.). **Report of the Government Entomologist for the Year 1st April, 1935 to 31st March, 1936.**—*Rep. Dep. Agric. For. Palestine 1935–36* pp. 202–205. Jerusalem, 1937.

In the year under review, infestation of *Citrus* by *Ceratitis capitata*, Wied., was exceptionally heavy in all parts of Palestine [*cf. R.A.E.*, A **25** 391]. In fruit inspected at the ports, 21·3 per cent. of the total rejections were due to it. A survey showed *Lepidosaphes beckii*, Newm., to be widely distributed on *Citrus*. *Chrysomphalus ficus*, Ashm., produced an extra generation in the Acre Sub-District, and *Citrus* groves that were fumigated late in the season were heavily infested before they were treated. Great damage to sweet melons was done by *Myiopardalis pardalina*, Big., which had not previously been recorded as a pest in Palestine. Investigations are in progress on the bionomics of *Empoasca benedettoi*, Paoli, and its possible relation to virus disease of potato and egg-plant.

REEKS (W. A.). **Notes on the Biology of** *Microplectron fuscipennis*, **Zett. as a Cocoon Parasite of** *Diprion polytomum* **Hartig.**—*Canad. Ent.* **69** no. 8 pp. 185–187, 2 refs. Orillia, 1937.

Field and laboratory investigations have been conducted since 1934 on the bionomics of the Eulophid, *Microplectron fuscipenne*, Zett., introduced into Canada for the control of *Diprion polytomum*, Htg. on spruce [*R.A.E.*, A **23** 747 ; **25** 13]. In one forest reserve in Quebec, 43 colonies of *Microplectron* adults were recovered in the autumn of 1935. In 1936, liberations were discontinued there, so that the effect of the introductions in the previous years might be ascertained. Adult parasites of the overwintered generation started to emerge on 8th June from *Diprion* cocoons collected in late May, first-generation adults of reared material emerged from mid-July to mid-August, and a few second-generation adults from mid-September. The development of the parasite was retarded by cold, the mean temperature for July and August being only 58·3°F. In 1935, when there had been no cold midseason, the second generation had started to emerge on 19th August. There appears generally to be considerable overlapping, so that adults are present continuously from June to October. An average of 34 *Microplectron* adults emerged from field-collected cocoons, the maximum being 95, whilst a maximum of 100 emerged in the laboratory [*cf.* **24** 748].

In the laboratory, the maximum number of eggs laid was 215, but at 80°F. and 60 per cent. humidity, the average progeny of different lots of adults was 40–57. Under field conditions, 23 females, each provided with 6 cocoons, produced an average of 70 progeny. Not more than 4 cocoons in each 6 were parasitised.

The period from oviposition to adult emergence averaged 31 days. The average life of fed adults in field cages was also 31 days. In tests at low mean temperatures, oviposition was observed at 52°F., a batch of eggs hatched in 5·9 days at 57°, the larval period of females averaged 22 days at 59·7°, and the pupal period 24·3 days at 56·5° [*cf.* **24** 645].

Microplectron passes the winter in the last larval, prepupal and pupal stages. Experiments showed that the egg and younger larval stages could not hibernate. Larvae hatching from eggs laid after 22nd September in 1934, and 15th September in 1935, did not develop sufficiently to survive the winter, and eggs laid in late September succumbed to frost. The parasite has been found to thrive best in sunny, open stands, which are preferred by the host also.

Dorst (H. E.). **A Revision of the Leafhoppers of the *Macrosteles* Group (*Cicadula* of Authors) in America north of Mexico.**—*Misc. Publ. U.S. Dep. Agric.* no. 271, 24 pp. Washington, D.C., August 1937.

In 1888, Woodworth designated *Cicadula quadrinotata*, F., as the type of *Cicadula*, Zett., so that the commonly accepted designation of *Cicada sexnotata*, Fall., by Oshanin in 1912 is invalid. As *C. quadrinotata* is congeneric with *Thamnotettix prasinus*, Fall., which Oshanin designated as the type of *Thamnotettix*, the author sinks *Cicadula*, Zett., *sens. str.*, to *Thamnotettix*. The next available genus for *Cicadula*, auct. is *Macrosteles*, Fieber, of which *Cicada sexnotata* is designated the type. The author, however, erects two new genera, *Davisonia* and *Sonronius*, for some of the species. Keys are given to the 7 genera of the Macrostellaria division and to the North American species of the genera *Davisonia*, *Sonronius* and *Macrosteles*, all of which are described. The only species of the latter of economic importance is *M. divisus*, Uhl., the vector of yellows disease of aster and other plants. In American records, this species has been misidentified as *M.* (*Cicadula*) *sexnotatus*, which is a European species.

Packard (C. M.) & Benton (C.). **How to fight the Chinch Bug.**—*Fmrs' Bull. U.S. Dep. Agric.* no. 1780, 21 pp., 10 figs., 4 refs. Washington, D.C., August 1937.

An account is given of the bionomics of *Blissus leucopterus*, Say, on grain and grass crops in the United States, and of measures for its control, particularly the use of different types of barriers [*cf. R.A.E.*, A **23** 464 ; **24** 140, 318, etc.]. Leguminous crops are not attacked, and in maize-growing districts a rotation of maize, soy-beans, maize, oats, or wheat and clover considerably reduces infestation. Clovers, lucerne and vetches planted among small grains, and soy-beans or cowpeas among maize, produce conditions of dampness and shade that are unfavourable to the bugs. In infested areas, the yield from maize grown with soy-beans or cowpeas was 2–15 bushels per acre greater than that from maize grown alone. In extremely dry weather the beneficial effect of the leguminous crops may not be great. The bugs seldom congregate or breed in heavy stands of pure grain, and thorough tillage and ample fertilisation therefore help to reduce injury.

In favourable weather numbers of the bugs are destroyed by *Beauveria globulifera*. The Scelionid, *Eumicrosoma benefica*, Gah., sometimes

parasitises 30–50 per cent. of the eggs in different localities, but is seldom as common as this. It occurs in most of the States of the middle west and in one eastern State [*cf.* **25** 554], but has not been taken in the far west.

MERRITT (J. M.). **The Toxicity of Combinations of Nicotine, under Michigan Conditions, to the Tree and to the Codling Moth,** *Carpocapsa pomonella*, **Linn.**—*Tech. Bull. Mich. agric. Exp. Sta.* no. 154, 47 pp., 9 figs., 34 refs. East Lansing, Mich., April 1937. [Recd. September 1937.]

Experiments were carried out in Michigan in 1934 and 1935 on the effect, under local conditions, of various nicotine combinations on the codling moth, *Cydia* (*Carpocapsa*) *pomonella*, L., and on apple trees. Experiments in 1934 were arranged to determine the relative value of nicotine sulphate in combination with bentonite, bentonite-sulphur and summer oil ; lead arsenate was used as a standard of comparison. The experimental conditions, methods and materials are described. All schedules gave excellent control of the first brood, thus effectively protecting summer varieties. Schedules confined to the first brood did not give sufficient control on autumn varieties. Schedules including sulphur against the first brood injured fruit and foliage. Applications of oil (with nicotine sulphate) caused injury to foliage when they followed sulphur, but bentonite and nicotine sulphate with or without summer oil caused little or no injury. Lead arsenate gave the best control of deep entries, but caused more leaf-fall than sulphur.

In 1935, 3 series of materials were tested : combinations of nicotine sulphate with summer oil emulsions and with bentonite, and a soluble and non-volatile material, Nico-Zin. Some dropping of fruit and a reduction in the photosynthetic activity of the leaves resulted from the use of any schedule including oil in all cover sprays, but sprays without oil did not give good control. The results indicate that none of the nicotine combinations tested was more practical than summer oil and nicotine sulphate, which most satisfactorily controlled " stings " and deep entries, while producing fruit of good quality, though some were superior in one way, while inferior in others.

HASEMAN (L.) & others. **Entomology.**—*Bull. Missouri agric. Exp. Sta.* no. 387 (Rep. 1935–36) pp. 58–61. Columbia, Mo., July 1937.

Further investigations on the codling moth [*Cydia pomonella*, L.] on apple in Missouri in 1936 [*cf. R.A.E.*, A **25** 293, etc.] showed that when zinc arsenate, calcium arsenate, cryolite, fixed nicotine or thiodiphenylamine (phenothiazine) was substituted for lead arsenate in late cover sprays, control was substantially the same as when lead arsenate was used in all sprays, and the lead and arsenic residues on fruit at picking-time were reduced. Moths were observed to fly over a quarter of a mile from packing-sheds to orchards and were more numerous in orchards containing sheds.

The Hessian fly [*Mayetiola destructor*, Say.] was extremely abundant on wheat in the autumn of 1935 [*cf. loc. cit.*], but adverse weather conditions early in 1936 practically eliminated the flies at the time of emergence, and the yield of wheat was normal.

WILFORD (B. H.). **The Spruce Gall Aphid (*Adelges abietis* Linnaeus) in southern Michigan.**—*Circ. Sch. For. Univ. Mich.* no. 2, 35 pp., 8 figs., 8 refs. Ann Arbor, Mich., 1937.

The economic damage caused by *Chermes* (*Adelges*) *abietis*, L., to spruce (*Picea*) in Michigan is limited chiefly to reducing the aesthetic value of the trees ; the growth of galls does not decrease wood-volume production of a stand as a whole, although individual trees may be affected. An account is given of the life-history of the Aphid in Michigan, which is similar to that already noticed from New York [*R.A.E.*, A **19** 479], of its abundance and spread, and of methods of control. Gall-formation and the injury caused are described in detail.

GRAHAM (S. A.). **The Walking Stick as a Forest Defoliator.**—*Circ. Sch. For. Univ. Mich.* no. 3, 28 pp., 5 figs. Ann Arbor, Mich., 1937.

The following is substantially the author's summary : Outbreaks of the Phasmid, *Diapheromera femorata*, Say, are becoming common in the north-central part of the Lower Peninsula of Michigan and will probably result in the infestation of practically all suitable stands. These forests are characteristic of the sandy moraine region and are the direct result of logging, followed by repeated fires. The black oaks provide the insect with an especially desirable food-supply and constitute the only forest type in which outbreaks have been observed in Michigan. The eggs hatch in late spring and early summer, and the young insects crawl from the ground to the tree-tops, where they feed on the foliage. They reach full size in August and continue to feed, mate and oviposit until autumn. The small bean-like eggs are dropped to the ground and probably two winters pass before they hatch. The long incubation period is not necessarily invariable, however, as indicated by laboratory observations in which eggs exposed to fluctuating winter temperatures hatched in the spring following oviposition. In the Ogemaw State Forest, the insects appear in alternate years, elsewhere each year. The latter condition is probably explained by alternating broods. Infestations spread slowly at a maximum rate of about a furlong a year. The sex ratio is normally 0·5, but males predominate both in newly infested spots, because of their relatively active habits, and in places where the infestation is dying out, probably because of the differential mortality of the sexes under adverse food conditions.

Although defoliation occurs late in the season, the insects can kill the trees after 10–15 years of defoliation. More than half of the black oaks in an infested area are likely to be killed, but the white oaks and other trees are not injured. The selectivity on the part of the insect will result ultimately in improving the composition of the forest. The improvement might be hastened by planting white oaks and conifers under black oaks, either before or after an outbreak has occurred, with subsequent cultural operations. Conversion of the forest to non-susceptible types is the least expensive and most permanent method of control, but requires at least 10 to 15 years to become effective. Such improvements, as a protection for the future, should be made promptly wherever possible, especially round resort areas. Where it is advisable to use direct measures of control, calcium arsenate should be applied at the rate of 20 lb. per acre either as a

liquid spray or in the form of a dust. Insect parasites and disease-causing organisms have not been observed in the outbreaks in Michigan, but birds flock into the infested areas and feed upon the insects.

CANTRALL (I. J.). **Notes on the Infection of the Seventeen-year Cicada, *Magicicada septendecim* (Linn.) by the Fungus, *Massospora cicadina* Peck.**—*Bull. Brooklyn ent. Soc.* **32** no. 3 pp. 120–121, 1 ref. Lancaster, Pa, June 1937.

Of adults of *Magicicada septendecim*, L., observed in one locality in Michigan on 21st June 1936, 53 per cent. were females, most of which had not yet oviposited. Of 163 adults collected, 10 per cent. of the males and 31 per cent. of the females were infested with *Massospora cicadina*. This fungus had previously been stated to infest the males almost exclusively [*R.A.E.*, A **10** 283]. In a collection made on 30th June at a locality 5 miles away, there were 25 males and 128 females, of which only 3 and 2, respectively, were infested.

WILLE (J. E.). **Informe sobre el control biológico de las queresas del Olivo en el Valle de Yauca y de diversas plagas en el Valle de Chanchamayo.** [Report on the biological Control of Olive Scales in the Yauca Valley and on various Pests in the Chanchamayo Valley.]—*Inf. Direcc. Agric. Minist. Fom. Peru* no. 42, 16 pp., 10 pls. Lima, July 1937.

This report comprises three sections, written in December 1936 and May and July 1937. In the first, it is stated that the olive groves in the Yauca valley, Peru, became infested with *Saissetia oleae*, Bern., in 1931–32, and as crop losses amounting to 25 per cent. of the normal yield continued in spite of spraying, parasites were imported from California. Larvae, pupae and adults of *Scutellista cyanea*, Motsch., larvae and pupae of *Aphycus lounsburyi*, How., and pupae of a species of *Lecaniobius* reached Lima on 7th December 1936 after a 5-day journey by air, and on 12th December the box containing them was placed in the crown of a heavily infested olive tree and opened. On the following day the twigs infested with parasitised scales were removed from the box and hung up in the same tree. The second section records the total destruction of all the scales over about 100 acres within a radius of 300–500 yards of the point of liberation of the parasites in December, and the activity of the latter outside this area. *Lecanobius*, *Scutellista* and *Aphycus* were found in the proportions of 100 : 10 : 3, whereas the respective proportions at the date of liberation were 6 : 100 : 60. Twigs infested with parasitised scales have been distributed elsewhere in the Yauca valley and have been taken to the Ilo valley, where *S. oleae* is a serious pest of *Citrus*.

The third section gives the results of an inspection in the valley of Chanchamayo and forms a continuation of a report of a previous visit [*R.A.E.*, A **24** 330]. *Anastrepha fraterculus*, Wied., was found in the entire zone of the Chanchamayo river and its tributaries, but infested only about 1 per cent. of the *Citrus* fruits. This slight infestation had previously escaped notice ; it is probable that the heavy rains peculiar to the district destroy so many of the flies that an outbreak is impossible. This climate must also be considered largely responsible for some reduction in the infestation of *Citrus* by the Coccids, *Lepidosaphes beckii*, Newm., *Selenaspidus articulatus*, Morg.,

and *Coccus* (*Lecanium*) *hesperidum*, L., though Coccinellids were undoubtedly active [*loc. cit.*]. The tender leaves and shoots of *Citrus* were injured and sometimes killed by leaf-cutting bees of which *Melipona* (*Trigona*) *testacea* subsp. *cupira*, Smith, was the most important. Serious harm to avocado trees was caused by the branches being cut off by the Lamiids, *Oncideres* sp. and *O. poecila*, Bates.

MENDES (L. O. T.). **Sobre o combate ao** *Lepidosaphes citricola* **Packard, praga das laranjeiras no estado de S. Paulo.** [The Control of *L. beckii*, Newm., a Pest of *Citrus* in the State of S. Paulo.]—*Bol. tech. Inst. agron. Campinas* no. 32, 30 pp., 9 refs. Piracicaba, 1937. (Repr. fr. *Rev. Agric.* **12** nos. 8–9, August–September 1937.)

This is a report of experiments in 1934 with contact sprays against *Lepidosaphes beckii*, Newm. (*citricola*, Pack.), the chief Coccid pest of *Citrus* in the Brazilian State of São Paulo. Comparative tests were made of 6 commercial products, including Woolrex oil no. 1,000, and 3 home-made oil emulsions. These were 8 parts cottonseed oil, 4 parts water and 1 part soap, and 4 parts castor or Diesel oil, 2 parts water and 1 part soap. For computing percentage control, the formula recommended by Swingle & Snapp [*R.A.E.*, A **20** 18] was used, *viz.* 100 $(ax-z) \div ax$, where a is the percentage alive in controls at the close of the experiment divided by the percentage alive in controls at the beginning of the experiment, and x and z are the percentages alive in the plots before and after treatment, respectively.

Used at a concentration of 1·5 per cent., none of the insecticides killed more than 75·56 per cent. of the adults in October. This percentage was obtained with cottonseed oil, while Woolrex no. 1,000 and castor oil came next with 72·8 and 66·2 per cent., respectively. Further tests were then made in October with these three oils at 1, 2 and 3 per cent. concentrations. Their efficiency varied with the concentration ; at 3 per cent. they did not scorch the leaves or new shoots, and the percentage mortalities obtained were 91·71 with cottonseed oil, 91·24 with Woolrex, and 78·12 with castor oil. When tested at a 2 per cent. concentration in October and November, there was no significant difference in the results obtained in the case of cottonseed oil or castor oil, but Woolrex was less effective in November and caused some scorching of new leaves.

HARLAND (S. C.). **A Note on two Larval Parasites of the Sugar-cane Moth-borer in São Paulo, Brazil.**—*Trop. Agriculture* **14** no. 10 p. 280. Trinidad, October 1937.

Metagonistylum minense, Tns., and *Paratheresia brasiliensis*, Tns., were reared from *Diatraea* in sugar-canes from São Paulo, Brazil. Parasitism by the former was about 56 per cent. Many of the pupae of the parasites were attacked by an unidentified hyperparasite. The São Paulo form of *M. minense* is a melanic variant of the form recently introduced into the West Indies [*cf. R.A.E.*, A **24** 435, etc.] to control the sugar-cane borer, and is probably of a different biological race that may prove more adapted to conditions in some of the West Indian islands. It is also possible that the two forms may cross and give rise to new forms with a wide range of adaptability.

SQUIRE (F. A.). **A Theory of Diapause in** *Platyedra gossypiella* **Saund.** —*Trop. Agriculture* **14** no. 10 pp. 299–301, 1 pl., 1 graph, 8 refs. Trinidad, October 1937.

The climatic conditions cited by Taylor as inducing short-cycle development of larvae of *Platyedra gossypiella*, Saund., in Uganda [*R.A.E.*, A **25** 354], where long-cycle larvae are not known, are also found in the West Indies in Nevis and Montserrat and, allowing for the porosity of the soil which counteracts a higher rainfall, in St. Vincent, and at the same time long-cycle larvae occur regularly. The cotton crop is grown at different times of the year on the several islands of the lesser Antilles, and observations show that resting stage larvae develop towards the end of the cotton crop at whatever time of year this may be, and that their association with the onset of winter in some countries and aestival conditions in others is purely accidental. In St. Vincent, cotton is planted in September, and the larvae enter the resting stage during the dry months from January to the end of April, when the close season starts. In Montserrat, on the other hand, cotton is planted in February, and the larvae enter the resting stage during the wet months from August to November. In every case the resting stage first occurs after the fifth month of growth.

Several hundred cotton bolls were collected in March from a severely-infested field in St. Vincent, and the larvae from them were reared on similar food to that in which they were taken. All of the 60 bollworms present in bolls containing seed still white pupated normally, of those present in bolls containing unripe black seeds 43 pupated normally and 15 entered the resting stage, and of those present in ripe black seeds 35 pupated normally and 106 entered the resting stage. Observations of larvae from bolls collected in late April also showed that it is mainly on ripe bolls that the resting stage is produced. Field observations indicate that the small percentage of resting larvae found in green bolls (0·9–5·9 per cent.) does not occur in nature and was probably caused by keeping the bolls in the laboratory for 7–10 days before analysis, in which time the bolls ripened and dried. Larvae were also collected from several hundred infested flowers in the same field and reared on floral parts ; in every case they pupated directly. Capsules of an alternative food-plant, *Hibiscus esculentus*, were examined ; 47 per cent. of the larvae in the dry capsules entered the resting stage, while none of those in the green ones did so. A number of larvae of all instars were then fed on green and ripe seed ; 40 per cent. of those surviving on a diet of ripe seed entered the resting stage, while all of those fed on green seed pupated normally. Larvae of the first and second instars died when fed on ripe seed. The conditions in the field that induce long-cycle development are concluded to be the increase in the ratio of ripe to green bolls and a sufficiently high incidence of the larvae to necessitate the infestation of ripe and ripening bolls normally rejected for the younger ones.

In further experiments in which 50 resting larvae were kept in moist cotton wool, 9 had pupated in 2 days, 19 in 6 days, 30 in 9 days, 32 in 13 days and 48 in 20 days. The other 2 larvae failed to pupate in spite of frequent applications of water. During this time none of 50 control larvae pupated. The experiment was repeated twice with similar results. Observations on seed-cotton kept in the laboratory in dry conditions showed that emergence occurred fairly regularly in spite of the lack of moisture. It is therefore concluded that although the

addition of water to the tissues of the dormant larvae expedites emergence, it is not absolutely necessary and in a small number of cases fails to terminate the diapause.

WILLARD (H. F.) & MASON (A. C.). **Parasitization of the Mediterranean Fruitfly in Hawaii, 1914–33.**—*Circ. U.S. Dep. Agric.* no. 439, 18 pp., 3 figs., 10 refs. Washington, D.C., July 1937.

The percentage parasitism of *Ceratitis capitata*, Wied., in all fruits in Hawaii, by each of the four introduced parasites, *Opius humilis*, Silv., *Diachasma* (*O.*) *tryoni*, Cam., *D.* (*O.*) *fullawayi*, Silv., and *Tetrastichus giffardianus*, Silv. [*cf. R.A.E.*, A **18** 341, 631, etc.], in each month of the years 1914–33, is given in a table. On an average 110,000 fruits were collected annually, mostly from the island of Oahu, for the compiling of these records. A second table shows the parasitism by each species in each year from 1914 to 1933 and the total parasitism for each year, which ranged from 24·9 to 56·4 per cent. *O. humilis*, *D. tryoni*, *D. fullawayi* and *T. giffardianus* parasitised averages of 13·1, 20·0, 2·9 and 6·3 per cent. of the larvae of *C. capitata* annually in the 20 years, and they reached their maximum efficiencies in 1915, 1918, 1920 and 1923, respectively. *O. humilis* is the most abundant of the four in March and April, and *D. tryoni* during the other months [**8** 171]. The texture of the skin and the thickness of the pulp of the various fruits attacked by *C. capitata* influence the degree of parasitisation according to the facility with which the parasites can reach the host larvae. Parasitisation is easiest in coffee berries, which have thin skins and a thin layer of pulp. In one district on the island of Hawaii, multiple parasitism of larvae in coffee berries has eliminated *O. humilis*, and *D. tryoni* and *D. fullawayi* are keeping *C. capitata* under control. During the period 1922–29, *D. fullawayi* parasitised a higher percentage of larvae in coffee in this district than *O. humilis* and *D. tryoni* combined, but apart from coffee, *D. fullawayi* has been reared in very small numbers and from larvae in only a few varieties of fruits, since 1924. There was a marked decrease in the average infestation per fruit during the last decade of the period 1916–33, and average infestation per fruit for each of the years 1925–33 has also decreased in most varieties in comparison with the average for the period 1916–24. This decrease on the island of Oahu was due largely to parasites but also partly to other environmental factors.

PESCOTT (R. T. M.). **Insect Pests of Subterranean Clover.**—*J. Dep. Agric. Vict.* **35** pt. 8 pp. 371–375, 8 figs., 3 refs. Melbourne, August 1937.

A brief account is given of the bionomics of *Smynthurus viridis*, L. [*cf. R.A.E.*, A **21** 348, etc.], which is now widely distributed in both dry and irrigated areas of Victoria on subterranean clover [*Trifolium subterraneum*], also attacking lucerne and bur clover (*Medicago denticulata*). The vacuum fumigation of the clover seeds in order to prevent the distribution of its eggs in them is recommended; this destroyed all eggs in experiments in 1930. The predacious mite, *Biscirus lapidarius*, Kramer, which has been introduced into Victoria from Western Australia [*cf.* **21** 408, **22** 313, etc.] is now multiplying rapidly in the areas in which it has been liberated. It has also been found to occur naturally in several districts, in one of which

it is effectively controlling *Smynthurus*. Recommendations for control by grazing and spraying are given [**21** 407].

Halotydeus destructor, Tucker, and *Penthaleus major*, Dugès, are other major pests of subterranean clover, also attacking Cape-weed [*Cryptostemma calendulaceum*] in Victoria. They may be kept off clover plantings by surrounding them with a band of creosote [**22** 547, etc.], and controlled by fallowing [*loc. cit.*], or by dusting on warm days with a mixture of superphosphate or fine sand and carbolic powder (4 : 1) at the rate of 1–1½ cwt. per acre, preferably about a fortnight after the autumn rains. *Aphodius tasmaniae*, Hope, has recently increased in Victoria in pastures that include subterranean clover [*cf.* **22** 447].

Ward (K. M.) & Johnston (C. J. R.). **Citrus Red Scale. Progress Report on Investigations, 1935–6.**—*J. Dep. Agric. Vict.* **35** pt. 8 pp. 397–416, 16 figs., 24 refs. Melbourne, August 1937.

An investigation of the life-history and control of *Aonidiella aurantii*, Mask., in Victoria, where it is the most serious pest of *Citrus*, was begun in April 1935. Preliminary statistical studies on its natural mortality on 48 *Citrus* trees formed the basis of the method of sampling the population before and after treatment, and the laying-out of experimental plots.

A year's field studies showed that reproduction did not occur between May and November, although feeding, growth and the development of the young continued. The natural mortality reached 83 per cent. just before reproduction recommenced in the second or third week of November. The most active breeding period was December–April. There were two complete generations and a small partial third, but as the young are produced continuously, there is much overlapping. Insectary studies showed that, at a mean daily temperature of 72°F., the life-cycle occupied 69 days ; the female may live and reproduce for an additional 60 days, giving birth to as many as 145 larvae.

Four brands of oil emulsion each killed more Coccids than did two brands of miscible oils when applied at a common strength of 1·5 per cent. in laboratory spraying tests and of 2·5 per cent. in the field. This is attributed largely to the fact that the emulsions contained 16 per cent. less emulsifying agent. On leaves in the field, the emulsions gave 98·8 per cent. control and the miscible oils 97·3 per cent. The oils in general gave slightly less effective control on fruit than on leaves. Of the fruits harvested from plots sprayed eight months previously, 71 per cent. still had Coccids adhering to them, 86 per cent. of which were dead. In comparative trials, 2·5 per cent. was found to be a satisfactory strength for an oil emulsion spray against *A. aurantii*. Time-of-spraying trials showed that two summer sprayings, in December and January, resulted in 98·8 per cent. kill and 27 per cent. uninfested fruit at harvest, whereas a single summer spraying, and also a summer and autumn treatment, gave approximately 97·4 per cent. control and little over 10 per cent. uninfested fruit, and an autumn treatment gave only 95·8 per cent. control and 0·1 per cent. uninfested fruit.

Field fumigation trials with hydrocyanic acid gas were conducted under canvas frame tents [*cf. R.A.E.*, A **24** 170] with extensible legs and in cool weather. Chemical determinations were made, showing for each treatment the gas concentrations reached, the rate of leakage

of gas from the fumigation sheets and the concentrations at different parts of the tree. The experiments showed that liquid HCN and calcium cyanide in the form of Cyanogas dust and Calcid briquettes [**23** 268] were equally effective in destroying the Coccid, causing an average kill of 99·7 per cent., that dosages of liquid HCN 12·5 per cent. below the standard of four 16 cc. units per 600 cu. ft. did not result in reduced kill and 37·5 per cent. above the standard did not give 100 per cent. kill or cause additional tree injury, and that fumigation of fully-grown fruit two months before harvest did not prevent 99 per cent. of the fruit from being infested with dead Coccids when gathered.

CURRIE (G. A.). **Galls on *Eucalyptus* Trees. A new Type of Association between Flies and Nematodes.**—*Proc. Linn. Soc. N.S.W.* **62** pt. 3–4 pp. 147–174, 2 pls., 31 figs., 12 refs. Sydney, 15th September 1937.

The following is taken from the author's summary of this account of the Nematodes of the genus *Anguillulina* and Agromyzids of the genus *Fergusonina* that live in symbiotic association in galls on different parts of *Eucalyptus* spp., and which have been found to occur throughout Australia [*cf. R.A.E.*, A **21** 264; **23** 724]. The life-histories of the flies and the Nematodes have been worked out and their interdependence revealed. The Nematodes are found in the galls as free-living males and females. The first generation living in the galls is composed of parthenogenetic females, and there is an alternation of generations during which a generation of fertilised females is parasitic in the adult fly. The adult fly deposits the Nematode larvae in buds with its own eggs. The taxonomy and affinities of the Nematodes are discussed, and a new subgenus *Fergusobia* is erected to contain them.

Insect parasites of the flies are common, and their significance in controlling the numbers of flies is discussed. Large fluctuations in the number of gall-flies occur from season to season. In the flower-bud gall-forming species the erratic bud formation of the *Eucalyptus* is considered to be the factor mainly responsible for the fluctuations. In the leaf and stem-tip gall-formers, which are nowhere so plentiful as the flower-bud types, although availability of suitable young growth controls the numbers to some extent, parasites are thought to effect a considerable measure of control.

FYFE (R. V.). **The Lantana Bug, *Teleonomia lantanae* Distant.**—*J. Coun. sci. industr. Res. Aust.* **10** no. 3 pp. 181–186, 4 pls., 6 refs. Melbourne, August 1937.

The bionomics of *Teleonemia lantanae*, Dist., were studied by the author in Fiji in 1935 and subsequently at Canberra with a view to its establishment for the control of *Lantana camara* in the tropical and sub-tropical coastal regions of eastern Australia, where the weed has become abundant. In the rearing experiments conducted in Suva at 70–85°F. and 70–95 per cent. humidity, the Tingid was fed on leaves of *Lantana crocea*. The eggs are laid in the tissue of the midrib or one of the main veins on the under surface of succulent leaves in clusters of 10–30 in one vein, causing much distortion of the leaf. They hatch in 7–8 days. The nymphs feed on the green leaf tissue and complete

their 5 instars in 12–18 days. Within a day or two, the adult bugs start feeding on the flower clusters, though in the absence of these, they attack the leaves and stems, especially the growing tips. The females are fertilised, and begin to oviposit 5–6 days after becoming adult. Adults lived up to 3 months in the insectary. They fly and spread rapidly, especially on hot sunny days.

The effect on the plants of the feeding of *T. lantanae* is described in detail. The infested leaves curl and fall, the buds and flowers are destroyed, and the growth of the plant as a whole is affected, apparently owing to the injection of toxic saliva. Preliminary experiments indicate that the adults lay more eggs when fed on plants with flowers than without. In exhaustive tests in Fiji and at Canberra, the insect has been found to feed on no plant other than *Lantana*.

At Canberra, a species of *Nabis* thought to be *N. capsiformis*, Germ., was found to attack both adults and nymphs of *T. lantanae*, whereas in Fiji *Germalus pacificus*, Kirk., attacks nymphs only. Other enemies in Fiji include spiders, Coccinellids, Neuropterous larvae and a fungus, *Hirsutella* sp. [*R.A.E.*, A **24** 447, 448].

Of the batches of the Tingid despatched from Fiji to Canberra, some were placed on plants in cages and shipped as deck cargo. Others were supplied only with moisture from a cotton-wool pad connected by a wick to water and kept at about 55°F., 75 per cent. of these surviving the six-day journey. To destroy fungus spores, all imported adults were confined in batches of 40 in a cage of perforated celluloid and were dipped in a solution of 0·2 per cent. mercury bichloride in 70 per cent. alcohol for 30 seconds, and subsequently in distilled water. They were then placed in the sun, and 90 per cent. revived in 2–3 minutes. In sending large consignments to the *Lantana*-infested areas, a pad of moist cotton wool was placed in the inverted lid of a petri dish, a *Lanatana* leaf was pinned to the pad, and 40–50 adult bugs were put on the leaf. The dish was then attached to the lid with rubber bands, the pad being thus held between the rim and the lid. One preliminary liberation was made in New South Wales in October 1936, another in Queensland in November 1936, and a third on Norfolk Island in May 1937. The first two colonies have disappeared.

Rahman (K. A.) & Bhardwaj (N. K.). **The Grape-vine Thrips (*Rhipiphorothrips cruentatus* Hood) [Thripidae : Terebrantia : Thysanoptera].**—*Indian J. agric. Sci.* **7** pt. 4 pp. 633–651, 3 pls., 8 refs. Delhi, August 1937.

Descriptions are given of all stages of *Rhipiphorothrips cruentatus*, Hood, a destructive pest of grape-vines in the Punjab and South India, and its food-plants are listed, together with the localities in which it has been recorded. The adults pair 2–10 days after emergence, the males and females dying 2–7, and up to 20 days later, respectively. The pre-oviposition period varies from 6 to 14 days. The eggs are laid in slits on the lower surface of the vine leaves, the number laid by single females in captivity being 15–50. The duration of development varies with the season, 3–8 days being required for the egg stage and 11–25 for the larval, pre-pupal and pupal periods, together. There are 5–8 generations annually. The pupae occur on the plant during the active season, but the winter is passed by pupae hibernating in the soil under it. At the beginning of the season, the ratio of males to females

is about 1 : 3·7, and parthenogenesis occurs as well as sexual reproduction. Most of the hibernating pupae occur at a depth of 5 inches in the soil, though some were found from 2 to 10 inches below the surface. Experiments showed that very few were able to penetrate into compacted soil for hibernation and that the number of adults emerging from it was much less than from loose-textured soil.

Females and males were able to crawl over water for 9 and 3–5 inches, respectively. Both sexes survived submersion in water for 90 minutes, but not for 150 minutes. They survived exposure to 4°C. [39·2°F.] for 1 hour, but not for 5. Males were rather less resistant to cold than females.

Both the adults and larvae feed on the lower surface of the vine leaves, producing silvery patches, which later become brown and coalesce. Eventually the leaves wither and fall, and the thrips migrate to healthy ones. Infested grapes develop a corky layer and turn brown. Some varieties are more susceptible than others, and one, which has thick leaves with the lower surface thickly clothed with hairs, was not attacked at all, the insects caged on it dying within 4 days.

In experiments on control, banding the vines with an adhesive did not give positive results, and various chemicals recommended by Howlett [*R.A.E.*, A **2** 271] were useless as baits. Uncovering the roots is a common cultural practice and results in the destruction of many hibernating pupae. The replacement of the soil beneath the infested vines by fresh earth free from pupae is also beneficial. Spraying with tobacco decoction and nicotine sulphate, both with soap, gave a mortality of about 98 per cent. A decoction of the flowers, leaves, and twigs of *Calotropis procera* with soap gave 86 per cent. mortality, but, without soap, not more than 25 per cent. The lower surfaces of the leaves should be sprayed with special care.

R. cruentatus was parasitised by the Eulophid, *Thripoctenus maculatus*, Waterston, the original description of which is quoted. The adults pair on the vine leaves, and 3–5 days later the female oviposits in thrips in the first or second larval instar, laying 30–105 eggs. The incubation, larval and pupal periods last 5–10, 3–6 and 15–29 days respectively. The mature larva pupates on the leaves just in front of the host's skin, to which it often remains attached, and overwinters in this stage. The parasite is very abundant towards the end of the season.

Pruthi (H. S.) & Samuel (C. K.). **Entomological Investigations on the Leaf-curl Disease of Tobacco in North Bihar. I. Transmission Experiments with some Suspected Insect Vectors. II. An alternative Host of the Virus and the Insect Transmitter.**—*Indian J. agric. Sci.* **7** pt. 4 pp. 659–670, 3 pls., 16 refs. Delhi, August 1937.

The commonest sucking insects on tobacco in Pusa in 1934–35 and 1935–36 were *Crytopeltis* (*Engytatus*) *tenuis*, Reut., *Bemisia gossypiperda*, Misra & Lamba, and *Macrosiphum* sp. *Cyrtopeltis* was the most abundant and occurred almost throughout the season. In experiments, all of which gave negative results, on the transmission by it of the A, B, C and X types of leaf-curl of tobacco, nymphs and adults were fed on diseased plants for varying periods and were then transferred to healthy seedlings, on which they lived till their death,

some having laid eggs that gave rise to nymphs in the meantime. Details of these experiments are shown in appendices. In further tests, fluid from the thoracic region of *C. tenuis* fed on diseased plants was injected into about 20 young tobacco seedlings [*cf. R.A.E.*, A **18** 636], but these all remained healthy.

In 1935, *B. gossypiperda* was the commonest sucking insect on sunn-hemp [*Crotalaria juncea*], which was attacked by a virulent type of leaf-curl, somewhat resembling that of tobacco. Adult Aleurodids were transferred from diseased plants to healthy tobacco seedlings, some of which developed all the important symptoms of the A type of leaf-curl. Sunn-hemp is therefore regarded as one of the alternative hosts of this virus. It is not yet known whether *B. gossypiperda* can transmit the disease from tobacco to sunn-hemp or healthy tobacco.

Ramakrishna Ayyar (T. V.) & Mani (M. S.). **On three Chalcidoid Parasites of Cotton Borer-beetles from South India.**—*Rec. Indian Mus.* **39** pt. 2 pp. 125–127, 8 refs. Calcutta, 1937.

Descriptions are given of the females of a Pteromalid, *Neocatolaccus indicus*, sp. n., and a Eulophid, *Euderus pempheriphila*, sp. n., both parasitising *Pempheres affinis*, Fst., in cotton stems in South India. *Euderus gossypii*, Ferrière, parasitising larvae of *Sphenoptera gossypii*, Cotes, also in stems of cotton, is recorded from South India for the first time.

Nixon (G. E. J.). **Some Asiatic Telenominae (Hym., Proctotrupoidea).** —*Ann. Mag. nat. Hist.* (10) **20** no. 118 pp. 444–475, 12 figs., London, October 1937.

Descriptions are given of 16 egg-parasites of the genus *Telenomus*, 12 of which are new. The latter include *T. cyrus* from *Nezara viridula*, L., in Java, *T. triptus* from *Scotinophara coarctata*, F., in Malaya, *T. attaci* from *Attacus atlas*, L., in Malaya and Siam, *T. dignoides* from *Scirpophaga intacta*, Sn., in Java, and *T. remus* from *Spodoptera mauritia*, Boisd., in Malaya. The others are *T.* (*Phanurus*) *rowani*, Gah., and *T.* (*P.*) *dignus*, Gah. [*R.A.E.*, A **13** 432], which are recorded as parasites of the eggs of *Schoenobius bipunctifer*, Wlk. (*incertellus*, Wlk.) in Java, and the second also in China, *T. tirathabae*, Ferrière [**21** 360] and *T.* (*P.*) *beneficiens*, Zehnt. As species of *Telenomus* tend to be highly specific in their choice of hosts, the author doubts whether many of the references in the literature to *T. beneficiens* on a variety of hosts are correct, and proposes to restrict the name to an insect known to breed in eggs of *Diatraea venosata*, Wlk. (*striatalis*, Sn.) and agreeing tolerably well with Zehntner's figure and description.

Cuthbertson (A.). **Biological Notes on some Diptera in Southern Rhodesia.**—*Proc. Rhod. sci. Ass.* **35** pt. 1 pp. 16–34. Salisbury, S. Rhod., August 1937.

This paper includes very brief notes on the following Tachinids that have been reared from hosts of economic importance : *Cuphocera hova*, Villen., from *Cirphis loreyi*, Dup. ; *Tachina* (*Exorista*) *aethiopica*,

Rohd., from *Laphygma exempta*, Wlk.; *Hyalomya cuthbertsoni*, Curran, from *Dysdercus fasciatus*, Sign.; and *Succingulum mistum*, Villen., from *Euxoa segetum*, Schiff.

HOWES (F. N.). *Tephrosia macropoda* **as a possible Insecticidal Plant.**—*Bull. misc. Inform.* **1937** no. 10 pp. 510–513, 3 refs. London, 1937.

Continuing the investigations of others on the insecticidal properties of *Tephrosia macropoda* [*cf. R.A.E.*, A **20** 444], the author tested the effect on insects of the roots of plants sown in Natal in 1934 and harvested after one or two years. The results, which are tabulated, suggest an improvement in the toxicity of the second year's growth, but indicate that, as a source of insecticides, *T. macropoda* could not compete commercially with derris, though the roots might be of use locally, probably as a dust.

Aperçu sur l'extension des insectes nuisibles et des maladies des arbres dans les forêts domaniales de Lettonie en 1935/36. [*In Lettish.*]—*Statist. for. Lettonie* **9** reprint 11 pp. Riga, 1937. (With a Summary in French.)

This report includes a section by L. Brammanis dealing with some 25 species of insect pests observed in various districts in Latvia on trees in forests during 1935–36. Of these, the pine weevil, *Hylobius abietis*, L., and the cockchafers, *Melolontha melolontha*, L. (*vulgaris*, F.) and *M. hippocastani*, F., were the most important. A table shows the local distribution of the different pests and diseases, and the frequency of their occurrence.

[LAVREKHIN (F. A.).] **Лаврехин (Ф. А.). Egg Production of the Grain Weevils** (*Calandra granaria* and *Calandra oryzae*) **in Relation to Age.** [*In Russian.*]—*Bull. Soc. Nat. Moscou* Sect. Biol. (N.S.) **46** no. 4 pp. 225–232, 1 graph. Moscow, 1937. (With a Summary in English.)

The results are given of experiments carried out at a temperature of 25–27°C. [77–80·6°F.] and fairly high air humidity on fertility in *Calandra granaria*, L., and *C. oryzae*, L. Fifty newly emerged pairs of each species obtained from infested wheat were confined in vials, 10 pairs in each with 200 grains of wheat having a moisture content of 19·2 per cent. After 3 days, the weevils were shaken out and kept on fresh grains with 12 per cent. moisture content for 7–8 days. Such transfers were repeated until the females died. At the end of about a month the grains were dissected and the progeny counted. The figure for the average number produced per female per day is used to express the degree of fertility. The fertility of *C. granaria* was very low (0·08) for the first 4–5 days, rose to 0·9 by the 14th day, remained at this for 35–40 days and then gradually decreased to 0 after 130 days. The last female died at an age of 155 days. *C. oryzae* showed high fertility even directly after emerging; and at 4–14 days it was 1·7. It increased during the first month to 2·5 and then diminished rapidly. The last females died at an age of 105–110 days. Their fertility at 103 days was 0·12. The total number of offspring per female was estimated as 77 for *C. granaria* and 175 for *C. oryzae*.

Schuch (K.). **Experimentelle Untersuchungen über den Nahrungswert von Kiefern- und Fichtenholz für die Larve des Hausbockkäfers** (*Hylotrupes bajulus* **L.**). [Experimental Investigations on the nutritive Value of Pine and Spruce Wood for the Larva of the House Longicorn, *H. bajulus*.]—*Z. PflKrankh.* **47** no. 11 pp. 572–585, 2 figs., 4 refs. Stuttgart, 1937.

As it has been observed that larvae of *Hylotrupes bajulus*, L., feed preferably in the youngest annual rings of wood, experiments were made with slabs cut from the outer sapwood, inner sapwood and heartwood of old pine. The average percentage increases of larval weight in 163 days were 208, 31 and 22 for the three woods, respectively, indicating that the youngest rings had the greatest nutritive value. In the outer sapwood, the tunnels were sometimes widened by feeding at the circumference. A similar result was noticed with young pine and spruce, and in tests with slabs that had not been barked, many of the tunnels were partly exposed when the bark was taken off. In slabs of outer sapwood that had been subjected to treatment with steam, the increase of larval weight was only 24 per cent., as compared with 208 per cent. in untreated slabs.

When seriously infested houses are inspected, it is customary in Germany to examine the attics of adjoining buildings, and often no traces of *H. bajulus* are found there. In samples of pine and spruce timber from such houses, all the test larvae, including newly hatched individuals, were able to develop, so that the timber in the uninfested houses was not in itself responsible for freedom from attack. Microclimate or even chance may be the reason. As a rule, severe infestations in Germany occur only in houses more than 20 years old, but this does not show that only well-seasoned timber is infested, as *H. bajulus* requires 3–11 years for development. In experiments with spruce wood, room-dried for 2, 7 and 14 months, the larvae increased in weight in all the blocks, nutritional conditions being best in those dried for only 2 months. These and other tests indicate that recently built houses are very liable to attack.

Amtliche Pflanzenschutzbestimmungen. [Official Regulations on Plant Protection.]—*Beil. NachrBl. dtsch. PflSchDienst* **9** no. 8 pp. 163–174. Berlin, 1st November 1937.

By this amendment to a regulation against the introduction of *Leptinotarsa decemlineata*, Say, into Germany [*R.A.E.*, A **25** 765], Switzerland is added to the countries from which imports are restricted, and the list of plants that may be imported throughout the year is greatly extended.

Defago (G.). **Observation sur les punaises des cereales en Suisse.**—*Bull. Murith.* fasc. 54 pp. 94–136, 10 figs., 40 refs. Lausanne, 1937.

An account is given of investigations on nine bugs found in Switzerland attacking wheat, barley and rye. Their adults and eggs are described and compared in keys. *Aelia acuminata*, L., and *Palomena prasina*, L., were rare, whilst *Dolycoris baccarum*, L., and

Syromastes (*Mesocerus*) *marginatus*, L., preferred weeds to cereals. *Eurygaster maura*, L., represented 50–70 per cent. of the bugs taken in the summer of 1936 and was the most widely distributed, occurring wherever cereals were grown. *Carpocoris pudicus*, Poda, and *C. pudicus fuscispinus*, Boh., representing 5–20 per cent. of the total catch, and *Eurygaster austriaca*, Schr. (also 5–20 per cent.) were limited to warm regions. *Palomena viridissima*, Poda, was found fairly often on cereals, though it preferred to attack the stalks of potato. The hibernated adults of *Eurygaster* and *Carpocoris* reach their highest concentration on the crop in late June, and under favourable conditions a concentration of nymphs of the new generation may appear in late July. As unripe crops are most attacked, spring wheat and that planted late suffer most. Early harvesting destroys half the nymphs on the crop. The optimum conditions for the bugs, two consecutive years in which May and June are fairly warm and dry, are unlikely to occur in Switzerland, though an examination of the most infested regions there indicate that an average of 16–17°C. [60·8–62·6°F.] in May and 18–20°C. [64·4–68°F.] in June with a rainfall of less than 3½ ins. would probably produce a heavy infestation.

Microphanurus semistriatus, Nees, and *Telenomus sokolowi*, Mayr, have been found ovipositing in the eggs of *Eurygaster* and *Carpocoris*. These Scelionids take 12–20 days to develop inside the host egg, whereas the unparasitised eggs generally hatch in 8–10 days. As a result of cold and rainy weather in June 1936, the bugs were ovipositing for 5–6 weeks and their eggs took 15 days to hatch. This favoured the parasites and enabled their very numerous second and third generations to coincide with the maximum oviposition of the hosts. They have 3–7 generations a year, the last developing mainly in eggs of *Carpocoris*. If the adults pair or oviposit, they live 3–4 days, otherwise they may survive for almost a year. They feed on the flowers of Umbelliferae and Cruciferae, and hibernate in humus. Of 827 eggs of *E. austriaca* exposed in field cages, 750 were parasitised when examined, and of 505 eggs of *E. maura*, only 5 hatched.

When *E. maura*, *E. austriaca*, *C. pudicus* and *P. viridissima* were reared on wheat in field cages, each caused serious damage to the plants, impaired the germinating power of grains and induced a complete decomposition of their gluten. Flour made from them affected other flour with which it was mixed [*cf. R.A.E.*, A **24** 218, etc.].

COSTANTINO (G.). **Contribuzione alla conoscenza degli insetti parassiti del cappero. I.** *Capparimyia savastani* **(Mart.) Bezzi.** [A Contribution to the Knowledge of the Insects attacking Caper. I. *C. savastani*.]—*Ann. Staz. Frutt. Agrum. Acireale* **14** pp. 137–159, 9 figs. Acireale, 1937.

Flower-buds of caper examined in Sicily for *Asphondylia capparis*, Rübs., which forms galls in them, were found to be infested also with larvae of *Capparimyia savastani*, Mart. A detailed account is given of the morphology of all stages and both sexes of this Trypetid and of observations on its biology in the laboratory and in the field. It was found to have 5–6 generations a year, hibernating in the pupal stage.

The adults, which first appear in April, feed on sugary exudations in the buds or on the leaves of caper or other plants growing nearby and on the honey-dew of insects such as *Pseudococcus citri*, Risso, which

also occurs on caper. Captive adults lived from December to June. Oviposition usually begins 3–4 days after pairing. As a rule the eggs are laid on the anthers or staminiferous filaments in the buds of the capers. Normally 4–5 eggs are deposited in each puncture. The duration of the egg stage varies from 3–5 days in May and June to 9–10 at the end of October. The larvae begin feeding on the stamens and anthers and then attack the petals and the ovary, destroying the interior of the bud in about a week and usually causing it to rot and fall. The larval stage lasts 10–12 days in June and 16–18 in November. Pupation usually takes place in the soil at a depth of about an inch, but may occur in the bud. The pupal period averages 15 days, with a minimum of 7 days in July. Infested flower-buds should be picked and burnt as soon as they are seen to be attacked.

COSTANTINO (G.). **Il *Cossus cossus* L. dannoso agli agrumi.** [*C. cossus* harmful to *Citrus*.]—*Ann. Staz. Frutt. Agrum. Acireale* **14** pp. 199–203, 4 figs. Acireale, 1937.

In 1936, larvae of *Cossus cossus*, L., were found injuring the bark at the foot of young orange and mandarin trees in Sicily. In two plantations of over 30,000 trees, about 50 were severely attacked and 9 or 10 were killed. The losses were restricted because the growers dug round all the plants, rendering it possible to kill the larvae and to assist injured trees to recover. As a rule a plant was attacked by one larva, which, after it had finished gnawing the bark round the root-collar, passed to another one nearby. The same measures were applied in 1937, so that the larvae became very scarce. Some growers stated that they were also found in the stems of artichoke [*Cynara*] growing in the *Citrus* plantations.

COSTANTINO (G.). **La protezione degli alberi contro l'ascesa delle formiche.** [The Protection of Trees against the Ascent of Ants.] —*Ann. Staz. Frutt. Agrum. Acireale* **14** pp. 223–233, 3 figs. Acireale, 1937.

For preventing ants from reaching the crowns of trees, bands of powdered talc (magnesium silicate) or of light magnesium carbonate, which is sold in blocks weighing about 3½ oz., have been found cheap and effective. The talc powder is applied with the palm of the hand, while the magnesium carbonate is applied by rubbing the block on the bark. Ants that are ascending cannot pass these bands, while those that are descending slide off to the ground. The light magnesium carbonate is easier to apply than the talc, and one block suffices for 70–75 trees with stems about 8 ins. round. One man can band about 300 nursery plants in a hour. The band must be renewed after strong wind, rain or heavy dew.

An effective and cheap viscous adhesive for banding can be prepared with 10 oz. powdered Manila gum copal (the gum of *Vateria indica*), 1 pint castor oil (density 0·938–0·940) and 1 oz. beeswax. The gum copal, which must pass through a sieve of 0·5 mm. mesh, is mixed with the oil in an aluminium or earthenware pan. After standing for 24 hours, the pan is placed on a hot plate or in a water-bath and stirred until the gum has melted. The beeswax is then added and stirred in.

[Stepantzev (I. N.), Kosobutzkiĭ (M. I.) & Lyubishchev (A. A.).] **Степанцев (И. Н.), Кособуцкий (М. И.) и Любищев (А. А.). The Methods of Interpretation of Data of entomological and phytopathological Records.** [*In Russian.*]—Roy. 8vo, 156 pp., 34 figs. (1 fldg.), 73 refs. Tashkent, SoyuzNIKhI, 1936. Price 5 *rub.* (With a Summary in English.) [Recd. November 1937.]

This work comprises an account of statistical methods used in investigating pests and diseases of agricultural plants. Its chief aim is to demonstrate their value by examples of their application in practice in Central Asia. Attention is concentrated on demonstrating the principles of approximate mathematical analysis when solving practical questions, introducing simple approximate methods of estimation and showing the chief ways for elaborating them. The subjects to which the methods are applied include the morphology, ecology and bionomics of pests, the factors affecting their abundance, their economic importance, the effectiveness of control measures, and the relative toxicity of different insecticides.

[Belanovskiĭ (I. D.).] **Белановский (И. Д.). Zwei neue Arten von Parasitenfliegen auf Zuckerrübenschädlingen.** [Two new Species of parasitic Flies from Pests of Sugar-beet.] [*In Ukrainian.*]—*Trav. Mus. zool. Acad. Sci. Ukr.* no. 19 pp. 217–222. Kiev, 1937. (With Summaries in Russian and German.)

Descriptions are given of both sexes of the Tachinid, *Graphogaster maculatus*, sp. n., reared from the black, beet weevil, *Psalidium maxillosum*, F., in the central part of North Caucasus in the spring of 1936, and of an aberrant male of *Tachina* (*Larvaevora*) *cinerascens*, Bel., which was one of a series of adults of this species reared from the larvae of *Loxostege sticticalis*, L., in the Province of Voronezh.

[Zakhvatkin (A. A.).] **Захваткин (А. А.). Études sur les tyroglyphides. 1. Le groupe Caloglyphini.** [*In Russian.*]—*Wiss. Ber. moskau. St. Univ.* **3** pp. 169–202, 4 pls., 30 refs. Moscow, 1937. (With a Summary in French.)

A comparative study of the literature on *Tyroglyphus mycophagus*, Mégnin, which Berlese made the type of his genus *Caloglyphus*, shows that the characters of this species as given by different authors are variable and even contradictory; on the whole, they do not conform with Mégnin's description. The author concludes that the true *T. mycophagus* has not been found since it was first described. Descriptions by the different authors of the mites that they considered to be *T. mycophagus* are analysed, and it is concluded that those described by Berlese and by Kramer were *Caloglyphus berlesei*, Mich., which thus becomes the type of *Caloglyphus*. Those described by Moniez, Oudemans and Vitzthum are renamed *C. moniezi*; those described by Schulze and Zacher are renamed *C. rodionovi*; and that described by Michael is renamed *Eberhardia alberti*. The true *T. mycophagus*, Mégn., is referred to *Caloglyphus*, but as it differs considerably in morphology from other species of the genus, a new subgenus, *Isoglyphus*, is erected for it and a new species, *C. sphaerogaster*, the latter being the type.

The characters are given of the genera *Caloglyphus*, with its subgenera *Caloglyphus* and *Isoglyphus*, and *Eberhardia*, with its subgenera

Eberhardia and *Cosmoglyphus*. The type of *Eberhardia* is *michaeli*, Oudm. (*agilis*, Mich. nec Can.) and that of *Cosmoglyphus* is *krameri*, Berl. Descriptions are given of the following species: *C.* (*C.*) *rodionovi*, which as been observed in Germany, France and different parts of the Russian Union attacking stored wheat, rye, oil-producing seeds and products made from them; *C.* (*C.*) *moniezi*, which has been found on a cockchafer near Moscow; *C.* (*Isoglyphus*) *sphaerogaster*, from a decaying onion near Moscow; *E.* (*E.*) *michaeli*, Oudm., from decaying cabbage in England; *E.* (*Cosmoglyphus*) *krameri*, Berl.; *E.* (*C.*) *rhizoglyphoides*, sp. n., from damp seeds of flax in Kostroma (northern Russia); *E.* (*C.*) *redikorzevi*, sp. n., from mouldy grain and cereal débris in Bashkiria; *E.* (*C.*) *alberti* from decaying fungi in England; and *E.* (*C.*) *agilis*, Can., from decaying vegetable matter in Italy. The species recorded by Oudemans from nests of the ant *Anoplolepis* (*Plagiolepis*) *longipes*, Jerd., in Java as *Tyroglyphus krameri*, Berl., is renamed *E.* (*E.*) *oudemansi*.

[Zakhvatkin (A. A.).] **Захваткин (А. А.). A short Key to the Granary Mites. 2nd Edn.** [*In Russian.*]—Med. 8vo, 31 pp., 36 figs. Moscow, Kom. Zagot. s.kh. Prod. SNK SSSR [Comm. Provis. agric. Prod. Council People's Commiss. USSR], 1936. Price 75 *kop.* [Recd. November 1937.]

This manual is intended for the use of persons engaged in the grain trade in the Russian Union, where stored grain and flour are severely infested by mites. Notes are given on the morphological characters and economic importance of mites in general, and the morphology, developmental cycle and habits of Tyroglyphids, which infest granaries, are discussed in detail.

A key is given to the 12 most important species occurring in the Russian Union, *viz.*: *Chortoglyphus arcuatus*, Troup., infesting grain and rice; *Ferminia* (*Glycyphagus*) *fusca*, Oudm., which has only recently been recorded in Russia; *Lepidoglyphus* (*G.*) *michaeli*, Oudm, observed in hay and grain in Leningrad and Bashkiria; *L.* (*G.*) *destructor mixtus*, Zkhv., *G. domesticus*, DeG., and *Tyrophagus noxius*, Zkhv., all of which infest grain and other vegetable products, the last-named being the most harmful; *G. ornatus*, Kramer, occasionally found in grain; *Monieziella* (*Histiogaster*) *entomophaga*, Lab., in grain and flour in southern parts of the Russian Union; *Tyroglyphus* (*Aleurobius*) *farinae*, DeG., which causes severe damage to grain and grain products; *Caloglyphus rodionovi*, Zkhv. [see preceding abstract], which is widely distributed in flour, oil-producing seeds and damp grain; *Aleuroglyphus* (*Tyroglyphus*) *ovatus*, Troup., which has only been found in and near Moscow infesting flour; and *Tyrophagus putrescentiae*, Schr. (*Tyroglyphus longior*, Gerv., *Tyrophagus dimidiatus*, Herm.), only found on rotting potato in Moscow. *Glycyphagus cadaverum*, Schr., is included in the key as, although it has not been recorded in Russia, other hairy mites have often been mistaken for it. *Aleuroglyphus* is a new genus, but no characters for it are given, other than those of its type species in the key.

A separate section deals with the morphology of the predatory Cheyletid mites in general, with brief notes on their bionomics, and this is followed by a key to the adults of *Cheletomorpha venustissima*, Koch, and *Cheyletus carnifex*, Zkhv., both of which are rare, and *Cheyletus eruditus*, Schr., which is numerous.

[Rodionov (Z. S.).] **Родионов (З. С.). Conditions for a Mass Development of Grain Mites.** [*In Russian.*]—*Zool. Zh.* **16** no. 3 pp. 511–546, 9 figs., 3 graphs, 30 refs. Moscow, 1937. (With a Summary in English.)

Detailed investigations on the biology of mites that attack stored grain, groats and flour in the Russian Union were carried out in 1934–36, with a view to evolving measures for preventing infestation. Examination of stored grain, groats and flour showed that only mites with short and sparse hairs on the body, such as *Tyroglyphus farinae*, DeG., *Ferminia fusca*, Oudm., *Aleuroglyphus ovatus*, Troup., and *Chortoglyphus arcuatus*, Troup., are able to penetrate into the flour. Species with long and dense hair, such as *Lepidoglyphus* (*Glycyphagus*) *destructor*, Schr., or *Glycyphagus domesticus*, DeG., can only develop on the surface of the heaps of flour or on the sacks. Different kinds of groats, which are deprived of the protective seed-coats and yet are not so compact as flour, offer particularly favourable conditions for the development of all species of grain mites. Daily observations on the development of mites on different food media showed that it was twice as intense in any kind of groats as in the grain from which the groats were made; thus the progeny of *Tyrophagus noxius*, Zkhv., in 30 days was 2–3 times as numerous in semolina as in wheat. In tests in which bran infested with *A. ovatus* was placed in a glass jar, together with seeds of various crops in small muslin bags, the mites migrated to the seeds, preferring those with a high content of nitrogen or fats, such as sunflower seeds. Only a few congregated on seeds of peas and lentils. In granaries, the development of all species of mites on the latter was very slow, and it is recommended, therefore, that if buildings are severely infested, peas and lentils should be stored in them. Repeated turning over of the stored grain or passing it through machines kills the mites [*cf. R.A.E.*, A **23** 78; **24** 591], as they are crushed by one grain rubbing against another; this method is useless, however, in the case of groats or flour, as most of the mites remain alive. Broken or injured grains are liable to infestation; though mites can live on grains with intact seed-coats, they do not increase in numbers owing to insufficient nourishment [*cf.* **25** 130]. In the Russian Union, most granaries serve only to shelter the grain against rain, snow and the direct rays of the sun, and protection of the mass of grain from humidity or fluctuations of temperature is chiefly effected by the upper layer. In spring and summer, this layer becomes damp as a result of the contact of the cool grain with the warm air, and the mites develop rapidly in it. It is essential, therefore, to prevent so far as possible the contact of heaps of loose grain with warm air. Dry grain is least infested when stored in deep shafts in elevators, owing to the comparatively small surface that is exposed to the air. Mites are especially attracted to products that have been stored for a considerable time and in which the process of decomposition has begun. Owing to seasonal and daily fluctuations in the temperature and humidity of the air, the environmental conditions in the different layers of grain constantly change, especially in autumn, which causes the mites to migrate from one layer to another, or sometimes even to abandon the granary. In spring, the mites usually occur in the upper layer of grain, which at that season is the dampest and warmest. As it becomes drier with the advent of summer, they migrate lower, and, in granaries with a warm damp basement, may develop in the bottom

layer of the grain heap. In autumn, the mites again migrate to the top layer, where they remain till severe frosts set in.

Laboratory experiments to determine the reaction of mites to different temperatures by placing them in a glass tube in which the temperature varied from 5°C. [41°F.] to 56°C. [132·8°F.] showed that *T. farinae* was the most resistant to cold, the greatest number of individuals (31·5 per cent.) congregating where the temperature was 19·34°C. [about 67°F.]. Other relatively cold-resistant species were *G. destructor*, 25·5 per cent. of which congregated at 23°C. [73·4°F.], and *T. noxius*, 28·5 per cent., of which congregated at 24·5°C. [76·1°F.]. *Caloglyphus rodionovi*, Zkhv., *Chortoglyphus arcuatus* and *A. ovatus* proved to be thermophilous, 30, 31·5 and 29·9 per cent. congregating at 34, 34·6 and 35·3°C. [93·2, 94·32 and 95·54°F.], respectively. The predatory mite, *Cheyletus eruditus*, Schr., preferred a temperature of 21·5°C. [70·7°F.] and may therefore occur with *T. farinae* and *G. destructor*, and to a less extent with *T. noxius*. All species were greatly attracted to high humidity.

The author concludes that the temperature and humidity of the medium are the chief factors on which the distribution and activity of grain mites depend. In the Russian Union, *T. farinae*, which is widely distributed, is the most important species in the north. *T. noxius* is prevalent in the centre and south ; the eggs are able to develop and hatch in water, and the adults survive in water for several days. *G. destructor* is particularly harmful in the south. *Caloglyphus rodionovi* is very common in fields, meadows and granaries ; the hypopi survive in cold or frozen water for several months. *Chortoglyphus arcuatus* and *A. ovatus* occur naturally only in the south, but are carried into the central areas of the Russian Union with infested products. *Cheyletus eruditus* is widely distributed in the north and centre and is able to adapt itself to high temperatures ; thus, large numbers of these mites occurred in 1936 in groats of which the temperature was 35°C. [95°F.].

Szymański (W.). **Chemische Zusammensetzung und Eigenschaften Polnischen Obstbaumkarbolineen.** [Chemical Composition and Properties of Polish Fruit-tree Carbolineums.] [*In Polish.*]—*Roczn. Ochr. Rośl.* **4** fasc. 2 pp. 42–92, 4 fldg tables, 38 refs. Warsaw, 1937. (With a Summary in German.)

A detailed account is given of the chemical composition and physical properties of 25 proprietary brands of tar-distillate spray fluids (fruit-tree carbolineums) made in Poland. The points determined were the stability of the preparation, its specific gravity, its content of oils of different boiling points and of tar acids, bases, neutral hydrocarbons and water, its ability to form emulsions, the stability of the latter, and their power of resistance to the effect of 0·1 per cent. magnesium chloride. There was a great difference in the quantities and properties of the different components of the preparations. In preliminary experiments with some of the emulsions to determine the causes of their retarding effect on the development of apple and pear twigs, it was found that it largely depended on the content of oils that boil only at above 270°C. and do not wash off the tree.

The history of the application of tar distillates against various pests in different countries since 1887 and of the investigations on their effectiveness is reviewed.

Referaty zgłoszone na czwarty letni zjazd Służby Ochrany Roślin w dniach 24–30 Czerwca 1937 roku w Krakowie. [Reports delivered at the fourth Summer Meeting of the Service of Plant Protection on 24th–30th June 1937 in Krakow.]—*Roczn. Ochr. Rośl.* **4** fasc. 3, 133 pp., 3 pls. Puławy, 1937.

Summaries are given of papers debated during the conference on plant protection in Krakow in 1937; they include the following:

Strawiński (K.). **Próba uzgodnienia receptury środków chemicznych używanych przez stacje ochrony roślin.** [An Attempt to standardise Formulae of chemical Preparations used by Plant Protection Stations] (pp. 38–49). With the extension of the activity of the Service of Plant Protection in Poland, the output of chemical preparations for the control of various pests and diseases has greatly increased, about 130 insecticides and fungicides being now on the market. In view of the fact that recommendations for their application vary considerably, the author suggests that they should be standardised and gives a brief critical review of the chief of them, based on reports of experiments at different Stations of Plant Protection, together with formulae for their application.

Ciślik (W.). **Co zdziałał osiec korówkowy** (*Aphelinus mali*) **w walce z korówka wełnistą w 1936 r.w Krakowie.** [What *A. mali* has done in the Control of the Woolly Aphis in Krakow in 1936] (pp. 70–71). Observations on *Aphelinus mali*, Hald. [*cf. R.A.E.*, A **24** 655] were continued in 1936 near Krakow. The adults appeared on 30th April, but though they became numerous a few days later, the woolly aphis [*Eriosoma lanigerum*, Hsm.] increased more rapidly at first and became very abundant on apple in the course of May and the beginning of June. During the next 8 weeks, however, the parasite destroyed practically all the Aphids. Rainy and cold weather in August and September then checked its increase, so that *Eriosoma*, which is less susceptible to cold, began to occur in numbers on some of the branches. In no case, however, was the infestation so severe as in the spring.

Szymański (W.). **O metodach badań nad biologicznym działaniem karbolineów sadowniczych** [On the Methods of Observations on the biological Action of Orchard Carbolineums] (pp. 72–76). The author considers that the value for the control of orchard pests of a given tar-distillate emulsion can only be determined by comparing its properties with those of the ideal preparation. All tar distillates retard the development of the trees to a greater or less extent, the oils that settle on them causing a disturbance in the vital processes. An ideal emulsion would break up on the body of the pest and would be toxic to it at low concentrations, whereas it would not break up on the tree and could be easily washed off, being harmful to it at only high concentrations. The emulsions are not the same before and after application, as contact with the air from the moment of the release of the spray causes various chemical and physico-chemical changes. The dependence of the insecticidal or phytotoxic properties of a spray on the qualities of the oil and of the emulsion can, therefore, be determined only if it is studied in the state in which it is after it has been applied. Since present investigations are not conducted on these lines, they are not reliable.

Szymański (W.). **Normowanie składu chemicznego karbolineów sadowniczych** [Standardising the chemical Composition of Orchard

Carbolineums] (pp. 77–82). A brief survey is given of the work carried out in Germany on the standardisation of tar-distillate emulsions (fruit-tree carbolineums) [*cf. R.A.E.*, A **25** 4], and the physical properties of 22 Polish brands are shown in a table. The following suggestions are made for the standardisation of Polish preparations: The term "orchard carbolineum" applies to a preparation made from oils obtained in the process of dry distillation of coal. It must be a uniform fluid without layers or precipitates. Oil must not separate from 5 and 10 per cent. emulsions in distilled water, when they are allowed to stand for 48 hours in sealed glass containers. It must contain not more than 15 per cent. tar acids and not less than 75 per cent. tar oils, of which at least 55 per cent. must dissolve in dimethyl sulphate. There are four types of carbolineums, prepared respectively from: anthracene oils in which at least 75 per cent. of the tar oils have a boiling point above 270°C.; heavy oils in which at least 75 per cent. have a boiling point above 230° and at least 20 per cent. above 270°; medium oils in which at least 55 per cent. have a boiling point within the limits of 200–230°C. and not less than 20 per cent. at above 270°C.; and mixed oils, in which at least 20 per cent. have a boiling point above 270° and 90 per cent. above 200°.

Sprawozdanie ze stanu zdrowia roślin w pierwszym kwartale roku 1937, według danych stacji ochrony roślin izb rolniczych, zestawione i uzupełnione przez dział ochrony roślin P.I.N.G.W. w Puławach [Report on the Condition of Plants in the first Quarter of the Year 1937 according to Data of the agricultural Substations of the Plant Protection Station, compiled and completed by the Section of Plant Protection of the State Scientific Institute of Agriculture in Pulawy] (pp. 83–95). This paper includes brief notes on the abundance of pests (chiefly insects) observed in various districts in Poland on vegetables and in orchards.

Minkiewicz (S.). **Owocówka jabłkówka** [Codling Moth] (pp. 129–133, 1 ref.). Owing to the neglected state of orchards in Poland, the codling moth [*Cydia pomonella*, L.] is widely distributed and causes severe losses in the crop of apples. It also attacks pears. The adults of the overwintered generation occur from late April to late June or even July; in 1937 the first eggs were observed near Pulawy on 22nd May. More eggs are laid on the small fruits of apple than on the leaves. The later first-generation larvae hibernate, but the earlier ones pupate in summer and give rise to adults that begin to emerge in July and produce a partial second generation. Experiments with sprays of lead arsenate or Paris green, both in Bordeaux mixture, were carried out in different localities in 1935 and 1936. The number of applications varied from 1 to 3, and in all cases the percentage of infested apples was considerably lower on the sprayed trees than on the controls. The spray containing lead arsenate was in most cases the more effective.

Bovey (P.). **Recherches sur le carpocapse des prunes** *Laspeyresia* (*Grapholita*) *funebrana*, **Tr.**—*Rev. Path. vég.* **24** fasc. 3–4 pp. 189–317, 9 pls., 59 figs., 75 refs. Paris, 1937.

A very detailed account is given of the bionomics of *Cydia* (*Laspeyresia*) *funebrana*, Treit., on plum in Switzerland [*R.A.E.*, A **25** 659] and of experiments on its control, together with brief notes on the bionomics of its parasites and hyperparasites.

The addition of lead arsenate to sprays of lime-sulphur only reduced infestation from 17 to 12–13 per cent., and the control given by sprays of synthetic cryolite was equally poor. The effectiveness of any stomach insecticides is bound to be low, as the larvae enter the fruit immediately on hatching, and reject the first material they remove from the surface of the plum. Spraying with white oils is not feasible, as they retard maturation of the plums and remove their bloom, so reducing their commercial value. Young trees were dusted 2–3 times with a powder containing 0·8–1 per cent. rotenone, and in three cases in two localities the infestation was reduced from 16, 61 and 71·5 per cent. to 6, 35 and 20 per cent., respectively. In another locality, where heavy rain followed the application, infestation was reduced from 17 to 13 per cent. Sprays containing nicotine, however, gave satisfactory results and reduced the damage considerably. Three sprays were tested, one containing 15–20 lb. soft soap and 1–1½ gals. 15 per cent. nicotine solution in 100 gals. water, and the others containing two proprietary nicotine soaps, one in liquid and the other in solid form. Two or three applications were made, the first 6–10 days after the moths of the first generation began to oviposit and the others at intervals of 8–12 days. Control was measured by an efficiency figure based on the relative infestation of sprayed and unsprayed trees. Two applications of the spray containing soft soap with sufficient nicotine solution to give 0·22 per cent. pure nicotine showed 93–96 per cent. efficiency. Three applications of a spray containing sufficient of the commercial liquid nicotine soap to give 0·17 per cent. pure nicotine showed 85–92 per cent., and two applications 82 per cent. efficiency. Two applications of either spray containing 0·1–0·15 per cent. pure nicotine were 70–94 per cent. efficient. A single application was insufficient. The commercial preparation in solid form gave more variable results because its wetting properties were less. It is therefore recommended that sprays containing 0·1–0·15 per cent. pure nicotine should be applied in May if the small fruits are scarce so that injury by the first generation is likely to be severe, and in July on late fruits liable to serious infestation by the second, the exact times to be determined at experiment stations by observation of oviposition in the orchard. Spraying should be thorough, as each fruit must be completely covered with a film of insecticide.

Of the insects bred in association with *C. funebrana* [*cf. loc. cit.*], *Hemiteles tricoloripes*, Schmied., *H. inimicus*, Grav., and its variety *longisetosus*, Schmied., *Eurytoma appendigaster*, Swed., and probably *H. hemipterus*, F., were hyperparasites; *Dibrachys cavus*, Wlk., and *Eupelmus urozonus*, Dalm., were both sometimes primary parasites and sometimes hyperparasites.

SPEYER (W.). **Erfahrungen bei der Schädlingsbekämpfung im Altländer Obstbau.** [Experiences in Pest Control in the Alte Land Orchards.]—*NachrBl. dtsch. PflSchDienst* **17** no. 11 pp. 87–88. Berlin, November 1937.

The author discusses some disadvantages consequent on the intensive spraying practised in the Alte Land orchard district on the Lower Elbe. For instance, infestation by *Paratetranychus pilosus*, C. & F., has increased because this mite is not affected by tar distillates, whereas the bugs preying upon it are destroyed [*cf. R.A.E.*, A **17** 501, etc.].

LAUE (G.). **Der Phosphorwasserstoff in der Schädlingsbekämpfung.** [Hydrogen Phosphide in Pest Control.]—*Z. hyg. Zool. Schädl-Bekämpf.* **29** no. 10 pp. 275–280, 26 refs. Berlin, 1937.

This is a review of data from the literature on the poisonous character of hydrogen phosphide. Hydrogen phosphide is obtainable as a solid ($P_{12}H_6$ or P_9H_2), liquid (P_2H_4) or gas (PH_3), this last form being the one used as a fumigant. Its use is increasing in Germany, the necessary precautions being provided for by regulations [*R.A.E.*, A **24** 476].

MERKEL (L.). **Amtliche Pflanzenbeschau im Freihafen.** [Official Plant Inspection in 1935 and 1936 in the Free Port of Hamburg.]—*Jber. Inst. angew. Bot. Hamburg* **53–54** (1935–36) pp. 116–129. Hamburg, 1937.

HAHMANN (K.). **Abteilung für Pflanzenschutz.** [Plant Protection Division.]—*T.c.* pp. 130–186.

These reports include records of insect pests of plants, etc., intercepted in or observed in or near Hamburg.

LINDINGER (L.). **Verzeichnis der Schildlaus-Gattungen. (Homoptera—Coccoidea Handlirsch 1903).** [A List of Coccid Genera.]—*Ent. Jb.* **46** (1937) pp. 178–198. Frankfurt a. M., 1937.

FERRIS (G. F.). **On Nomenclatorial and other Problems in the Systematics of the Coccoidea (Insecta : Homoptera).**—*Ann. Mag. nat. Hist.* (10) **20** no. 119 pp. 525–530. London, November 1937.

The first paper comprises a list of the Coccid genera, showing the author's views on synonymy, and the second is a criticism of it.

GIMINGHAM (C. T.). **Hover Flies killed by a Fungus.**—*Trans. Herts. nat. Hist. Soc. Fld Cl.* **20** no. 3 pp. 155–156, 1937. (Abstr. in *Rev. appl. Mycol.* **16** pt. 10 p. 673. Kew, Surrey, 1937.)

In August 1936, many thousands of adults of a Syrphid of the genus *Melanostoma*, probably *M. mellinum*, L., that had been killed by the fungus, *Empusa muscae*, were observed on flower heads of oats and plantains (*Plantago*) in a waste corner of a field on the Hertfordshire-Bedfordshire boundary. The flies frequently occurred in dense clusters or chains.

KOTTHOFF (P.). *Verticillium coccorum* **(Petch) Westerdijk als Parasit auf** *Puccinia chrysanthemi* **Roze.**—*Angew. Bot.* **19** no. 2 pp. 127–130, 2 figs., 1937. (Abstr. in *Rev. appl. Mycol.* **16** pt. 10 pp. 677–678. Kew, Surrey, 1937.)

In the course of investigations on *Verticillium* (*Cephalosporium*) *coccorum* in Westphalia, it was observed to make profuse growth on Coccids on apple twigs and on *Aspidiotus hederae*, Vall., on asparagus fern (*Asparagus plumosus*).

WALKER (M. G.). **A mathematical Analysis of Superparasitism by *Collyria calcitrator* Grav.**—*Parasitology* **29** no. 4 pp. 477–503, 2 figs., 13 refs. London, 1st October 1937.

The following is the author's summary: An outline of the life history of *Cephus pygmaeus*, L., is given. The parasites of *Cephus* [in England (*R.A.E.*, A **20** 95)] are listed and are discussed briefly in relation to the particular parasite, *Collyria calcitrator*, Grav. It is shown that if the host larvae collected from wheat-stubble in autumn are used for the investigation of the extent of parasitism by *Collyria*, allowance must be made for the fact that the parasite *Pleurotropis benefica*, Gah., is intrinsically inferior to *Collyria*, and that its cocoons must represent hosts left unparasitised by *Collyria*. In summer the adults of *Collyria* emerge, on the whole, earlier than those of the host *Cephus*. This suggests that at the beginning of the season of oviposition there will be a scarcity of hosts in comparison with the numbers of parasites wishing to oviposit. The relative activity of host and parasite during the egg-laying period is worked out on hypotheses of the average length of life of the individuals, and is shown diagrammatically. The *Cephus* larvae travel down the stem and hibernate at the base. When the wheat is cut, a proportion of the larvae and their parasites are removed with the straw. The way in which this may prevent the stubble material from giving a true indication of the degree of parasitism in the population as a whole is discussed. On the basis that 3,910 hosts receive 3,600 parasites [*cf.* **20** 545], various hypothetical distributions are worked out arithmetically in order to find which type of discrimination between healthy and parasitised hosts gives an arrangement of parasites most in agreement with what has been found for *Collyria* in *Cephus*. The most satisfactory result is that obtained when it is assumed that the probability of an already parasitised host being re-attacked varies with the proportion of parasitised hosts. It is also shown that a shortage of hosts at a time of parasite activity may cause a high degree of superparasitism, thus giving a false impression of the parasite's power of discrimination. Suggestions for further field work are given.

SALT (G.). **The Egg-parasite of *Sialis lutaria*: A Study of the Influence of the Host upon a dimorphic Parasite.**—*Parasitology* **29** no. 4 pp. 539–553, 5 figs., 25 refs. London, 1st October 1937.

Nearly a quarter of a million eggs of *Sialis lutaria*, L., were collected at Cambridge, England, in 1936. About 0·6 per cent. of them were attacked by a parasite, all the males of which were apterous. This parasite was reared in eggs of *Ephestia kuehniella*, Zell., which yielded females similar to those of the parent generation, but all the males were winged. It was identified as *Trichogramma semblidis*, Auriv., its structure agreeing exactly with the figures and description of this species, and comparison with *T. evanescens*, Westw., revealed considerable differences in the antennae of the males. When 6 males of each species were confined with 9 females of the other, several apparently complete acts of pairing took place, but in both cases only male progeny was obtained. *T. semblidis* exhibits true dimorphism, as the winged and apterous males are equally large and differ constantly and fundamentally in several characters, particularly the antennae and legs, and there are no intermediate forms. Of 419 males reared in eggs of *S. lutaria*, all except 2 were apterous, and 338 reared in eggs

of *E. kuehniella*, *Sitotroga cerealella*, Ol., and *Barathra brassicae*, L., were all winged. The rearing experiments involved isolated pure lines. The dimorphism is discussed, and it is shown that the two forms differ more fundamentally than those of any other example yet described in the parasitic Hymenoptera. It is the first time that the dimorphism of a Hymenopterous parasite has been shown to depend on the species of host in which it develops, and the honey-bee and *T. semblidis* are the only Hymenoptera in which dimorphism has been made subject to experimental control. In both cases the form depends on the kind of nourishment consumed during development.

Morris (K. R. S.), Cameron (E.) & Jepson (W. F.). **The Insect Parasites of the Spruce Sawfly (*Diprion polytomum*, Htg.) in Europe.**—*Bull. ent. Res.* **28** pt. 3 pp. 341–393, 20 figs., 31 refs. London, October 1937.

The following is the authors' summary: A severe outbreak of the spruce sawfly, *Diprion polytomum*, Htg., in eastern Canada led to a request to the Farnham House Laboratory of the Imperial Institute of Entomology to investigate, and if possible collect and export, the parasites of this insect in its native home in Europe. Work began in 1932, and it was found that *D. polytomum* was a comparatively rare insect in Europe, though widely distributed. It is heavily parasitised, 31 species of Hymenopterous and Dipterous parasites having been found up to the present. Nearly 28 million parasitised cocoons and eggs of this and other species of *Diprion* have been collected and despatched from Europe, and work is still continuing. Previous to the present investigation, only 13 species of parasites, a list of which is given, were recorded from this host. Of the 31 species now known, 15 are primary, 5 can be primary or secondary, and 9 secondary only; in 2 cases the status is not known.

Descriptions of all the species are given, and in the case of the obligatory and facultative primaries, the biology and immature stages are also described and notes added on their suitability for introduction into Canada. A key to the adult parasites is given as well as one to the larval stages of the primary and facultative primary parasites. Some practical notes are also given, including methods of accelerating the emergence of parasites in winter and methods of preparing parasite larvae for examination and identification.

Massee (A. M.). **An Eriophyid Mite injurious to Tomato.**—*Bull. ent. Res.* **28** pt. 3 p. 403. London, October 1937.

A description is given of *Phyllocoptes lycopersici*, sp. n., which infests tomato in Australia and New Zealand. This mite has not previously been described, although the name *P. lycopersici*, Tryon, has been used for it for several years [*cf. R.A.E.*, A **26** 45].

Hodson (W. E. H.). **On the Synonymy and Biology of the Strawberry Aphis, *Capitophorus fragariae*, Theo. (1912).**—*Bull. ent. Res.* **28** pt. 3 pp. 409–416, 9 refs., 2 pls. London, October 1937.

Descriptions are given of the alate and apterous viviparous females, apterous oviparous female, apterous male, and egg of the Aphid common on strawberry in England. The author discusses the identity of the species and concludes that it is *Capitophorus fragariae*, Theo., and that, although very similar to the American *C. fragaefolii*, Ckll., it is not identical with it [*cf. R.A.E.*, A **20** 17], the sexual forms

differing greatly from those attributed to *C. fragaefolii* by W. M. Davidson.

Apterous viviparous females are, throughout the year, present on the undersides of the strawberry leaves, usually at a junction of midrib and vein. In the south of England, asexual reproduction occurs in mild weather throughout the winter. Both the adults and nymphs are able to survive low temperatures for considerable periods, but heavy continual rain may destroy up to 70 per cent. of those found in open fields. From 5 to 20 individuals may be present upon a single plant in winter, representing a population of from 150,000 to 500,000 Aphids per acre. Mature alate females have not been found in the field before early June, but nymphs of this form sometimes occur in January, suggesting that the adults may be present in small numbers in early spring. In March, the rate of reproduction increases, and by late May or early June populations often reach outbreak proportions. From June until late autumn alatae are present, often in considerable numbers. In favourable weather they fly freely and sometimes swarm near heavily infested plantations. In hot dry weather, from the end of June until September, the rate of reproduction diminishes, but it increases again in September, when large colonies are again formed. Sexual forms have not been seen in the field, although eggs, apparently identical with those of this species, have been observed in heavily infested plantations. In the field, the Aphids have been found only on strawberry, but experimentally colonies have reproduced asexually for several generations on wild strawberry, *Potentilla* and cultivated rose, without any apparent loss of vigour, and have then returned to cultivated strawberry. On this food-plant colonies have been maintained continuously for over 2 years without showing any signs of degeneration. It is therefore concluded that the comparative scarcity of the Aphids on strawberry at some times of the year is probably not due to their migration to alternative food-plants.

Under laboratory conditions, alatae occasionally produced alatae, but usually apterous viviparae, and these last generally produced both apterous and alate viviparae [*cf.* **22** 462]. In December or January, however, a generation of apterous viviparae arises that produces many apterous viviparae, a few sexuales, but no alatae. Colonies of sexuales consist of either sex or approximately equal numbers of both. The males are very active and lived for 8–10 days, and the oviparae, which are active before fertilisation, lived for 13–18 days. Each female contained 4–5 eggs. These were deposited singly on the undersides of the leaves, on the stipules, and round the base of the plants. Unpaired females died without ovipositing.

These Aphids are vectors of at least one virus disease (yellow edge) of strawberry [**23** 290]. Planting material can be freed from infestation by treatment with hot water [**22** 234, 582], but control in established plantations is difficult. The insecticides tested have not, so far, given very good results, owing to the mechanical difficulties of applying them so as to get satisfactory coverage.

Smee (C.). **Notes on the Development of Red Locust Hoppers** (*Nomadacris septemfasciata*, **Serv.**) **under natural climatic Conditions.**—*Bull. ent. Res.* **28** pt. 3 pp. 417–427, 9 figs., 3 refs. London, October 1937.

To elucidate the factors responsible for the variation observed in the time required for development of hoppers of *Nomadacris*

septemfasciata, Serv., in different parts of Nyasaland during the four breeding seasons from 1932 to 1936, a comparison of climatic factors for the critical months by means of climatographs was made for the stations where this variation was most pronounced. Under natural conditions, temperature and humidity have considerable influence on the rate of hopper development, and on the numbers reaching the adult stage. During the season 1932–33, when development was generally normal, conditions were hotter and drier throughout the Protectorate than in later years, when there was a general increase in humidity and a decline in temperature. In areas where hopper development occurred each year without much variation in the rate or intensity, as in the lower Shire River Valley, temperatures and humidities had fluctuated but slightly from year to year.

The data obtained indicate that normal hopper development, lasting 75–85 days, occurs at a mean maximum temperature of 85°F. and mean relative humidity below 80 per cent. As the temperature increases to 90°F. and over and humidity decreases to 75 per cent., development becomes more rapid, the shortest period (56–60 days) being recorded at Port Herald in 1932–33, at temperatures over 90°F. and humidity below 75 per cent. At temperatures below 85°F., development is much prolonged ; it lasted over 100 days at Nkwale in 1934–35, when the temperatures fell below 85°F. and relative humidities ranged between 65 and 75 per cent. Humidities greater than 80 per cent. also appear to inhibit development. These records show agreement with experimentally determined favourable conditions of temperature and humidity [*cf. R.A.E.*, A **24** 228]. At Dedza, situated at a high altitude, the mean maximum temperatures in 1934–35 and 1935–36 were below 80°F., and although mature swarms passed over that area, no breeding occurred there.

Exceptional cases are recorded of normal hopper development at temperatures below 85°F., which occurred in some areas in the 1932–33 season, and its failure at Fort Johnston area in 1934–35 and 1935–36, in spite of apparently favourable conditions.

JAMES (H. C.). **Sex Ratios and the Status of the Male in Pseudococcinae (Hem. Coccidae).**—*Bull. ent. Res.* **28** pt. 3 pp. 429–461, 19 refs. London, October 1937.

In experiments carried out in greenhouses on reproduction in *Pseudococcus citri*, Risso (both aerial and root forms), *P. maritimus*, Ehrh., *P. gahani*, Green, *P. adonidum*, L. (*longispinus*, Targ.), and *Trionymus peregrinus*, Green, it was found that parthenogenesis did not occur in any of these species. The sex ratios were calculated and showed that the relative abundance of the males varied greatly in the different species. The fecundity of the females was very variable, and the family sex ratios showed wide intra-specific disparity in families from females of both low and high fecundity under uniform conditions of the environment. Cytological studies of *P. citri* and *P. maritimus* showed that there was no differential production of gametes in the digametic sex and that intersexuality did not occur. There was, however, an abnormality in the reduction division of the male, and this may indicate an incipient degeneracy in one set of gametes, which is not evident in the fully formed sperms, but which is expressed in variability in their functional efficiency. Unisexual families of females

were produced by some of the fertilised females of *P. adonidum*. In *P. citri* delayed fertilisation increased the proportion of males, and the increase was proportional to the period of delay.

WILKINSON (D. S.). **A new Species of *Apanteles* (Hym. Brac.) bred from *Myelois ceratoniae* attacking Carobs in Cyprus.**—*Bull. ent. Res.* **28** pt. 3 pp. 463–466, 3 figs. London, October 1937.

Descriptions are given of both sexes of *Apanteles myeloenta*, sp. n., parasitising the Pyralid, *Myelois ceratoniae*, Zell., on *Ceratonia siliqua* in Cyprus. So far the parasite has been bred only from material in old carob-pods on the trees in autumn. Alterations in the author's key to the genus *Apanteles* [*R.A.E.*, A **21** 135] are suggested to permit the inclusion of this species and two American species that have recently become known to him.

MARSHALL (Sir G. A. K.). **New injurious Curculionidae (Col.).**—*Bull. ent. Res.* **28** pt. 3 pp. 467–477, 1 fig., 1 pl. London, October 1937.

The new species of weevils described comprise : *Blosyrus ipomoeae*, the adults of which attack the leaves of sweet potatoes, and *Analeurops* (gen. n.) *cuthbertsoni* on young tobacco, young cowpeas and sunn hemp [*Crotalaria juncea*], in Southern Rhodesia ; *Eremnus angustirostris* on young maize, *Brachycerus citriperda* on *Citrus*, and *Ocladius dianthi*, the larvae of which bore in the stems of carnations, in South Africa ; *Naupactus bondari* and *Thegilis theobromae* on cacao, *Promecopsis canavaliae* on *Canavalia ensiformis* and *Erythrina*, and *Conotrachelus licaniae* on *Licania rigida*, in Brazil ; *Amorphoidea pectoralis* on cotton flowers in Java ; and *Catagmatus clematidis* on *Clematis* in Sumatra.

GHILAROV (M. S.). **Root Aphids and Ants affecting Rubber-producing Plants.**—*Bull. ent. Res.* **28** pt. 3 pp. 479–482, 1 fig., 3 refs. London, October 1937.

In the Ukraine, the roots of the rubber-producing plants, *Scorzonera tau-saghyz*, *Taraxacum kok-saghyz* and *T. megalorhizon*, are sometimes infested by the Aphids, *Trama troglodytes*, Heyd., *Aphis plantaginis*, Schr., *Trifidaphis phaseoli*, Pass., and *Xerophilaphis scorzonerae*, sp. n., of which last the virginiparous apterous females are described by A. K. Mordvilko. The first two species are not very numerous and occur on roots infested by the others. *T. phaseoli* feeds on the thin lateral roots, killing the distal parts and destroying small or weak plants under dry conditions. Thus, in a drought in 1934, about 40 per cent. of the plants of *S. tau-saghyz* were infested in some fields and about 17 per cent. destroyed. At the same time 60–80 per cent. of the rubber-producing plants were killed by *X. scorzonerae* in association with the ant, *Lasius niger alienus*, Först.

X. scorzonerae, the distribution of which is discussed, occurs in great abundance on the roots of the local wild Compositae, even in areas at considerable distances from rubber-producing plants. It lives on the roots of the plants, in deep pits or channels eaten out by the ants. The latter gnaw the roots at points where the Aphids have already

been sucking and transport the Aphids to new places that they have cleaned. They have never been observed attacking the plants in the absence of Aphids. There may be a very heavy infestation of Aphids in the absence of ants, but the pits and channels do not then occur and the Aphids live on the upper part of the root, at the base of the leaves, or even on their lower surface if the moisture content of the soil is high. The whole life-cycle takes place on the roots and rhizomes of Compositae. The winter is passed in both the egg and adult stages, the apterous virginiparous females hibernating in the pits on the roots at a depth of about 3½ inches. They begin to reproduce on second-year rubber-producing plants in the first half of April. At the beginning of June, both winged and wingless females develop, and the former migrate to new fields of young plants. Damage is most serious from June to August. Winged virginiparous females are found until the end of July or the beginning of August, when they disappear and the infestation of fresh plants ceases. At the same time the numbers in the colonies decrease, probably because the roots are coarser. Only 1–2 adults and 10–15 nymphs are found on each plant in September and October, whereas the upper parts of the roots are covered with them in June and July. At the end of October, the sexuparae appear, and the winged males pair with the wingless females. The eggs are laid on the upper surface of the leaves of various Compositae at the beginning of November.

Lasius niger alienus fosters *Trifidaphis phaseoli* and *Trama troglodytes* in a similar fashion, and in association with the former causes considerable damage. Another ant, *Solenopsis fugax*, Latr., which is entirely subterranean, is also sometimes associated with *X. scorzonerae*, but more usually with *T. phaseoli*. Colonies of *X. scorzonerae* fostered by this ant live on the thin lateral roots, rather deep down, in situations where they do not otherwise occur.

Summary of agricultural Legislation in Cyprus.—*Bull. Dep. Agric. Cyprus* no. 4, 23 pp. Nicosia, April 1937. Price 6*d*. [Recd. November 1937.]

In the part of this bulletin (pp. 10–20) that deals with legislation against plant pests and diseases, summaries are given of the Orders issued under the Diseases of Plants Prevention Law (no. 6 of 1893) at present regulating the importation of plants and the measures to be carried out against pests and diseases within the country. In addition to Orders already noticed [*R.A.E.*, A **14** 199; **20** 436; **21** 631; **23** 510] summaries are given of measures enforceable for the control of locusts, of *Hyponomeuta padellus malinellus*, Zell., on apple, and of *Lepidopsaphes beckii*, Newm., on *Citrus*.

Morris (H. M.). **Annual Report of the Entomologist for 1936.**—*Rep. Dep. Agric. Cyprus 1936* pp. 40–49. Nicosia, 1937.

During 1936, *Lepidosaphes beckii*, Newm., was still abundant on *Citrus* in one area in Cyprus, and altogether 11,904 trees were fumigated with hydrocyanic acid gas. In some plantations, fumigation was also carried out against a few individuals of *Icerya purchasi*, Mask.,

on *Citrus* plants that had been imported from Palestine in 1934 [*cf. R.A.E.*, A **25** 66].

Dociostaurus maroccanus, Thnb., which was in the solitary phase, and *Calliptamus italicus*, L., were considerably more abundant than in 1935; *Tettigonia viridissima*, L., occurred in some localities. *Mayetiola destructor*, Say, was particularly common on early wheat and barley in some districts. In August and September, larvae of *Antigastra catalaunalis*, Dup., severely damaged pods of *Sesamum orientale*; this Pyralid had not previously been recorded as a serious pest in Cyprus, although it was known to occur there. Unidentified mites on tomatos were controlled by dusting with sulphur, and the polyphagous Lygaeid, *Nysius cymoides*, Spin., which caused serious damage to vegetables, tobacco, vines and fruit trees, by a spray of nicotine sulphate. In tests of sprays against *Recurvaria nanella*, Hb., which attacks the flower buds of peach and almond, petroleum emulsion applied in winter when the young larvae are hibernating on twigs and at the base of the buds, gave more satisfactory control than lead arsenate applied when the buds began to swell. Observations showed that there were two overlapping generations of *Cydia pomonella*, L., annually; banding the apple trees with corrugated paper treated with a mixture of 1 lb. powdered beta-naphthol, 1½ pints lubricating oil and 1 pint petrol gave satisfactory results. *Aphelinus mali*, Hald., was introduced from England for the control of *Eriosoma lanigerum*, Hsm., on apple, but does not appear to have become established. During the first five months of the year, 71,160 queen hornets (*Vespa orientalis*, L.) were destroyed and 14,857 hornet nests were treated with calcium cyanide. Other pests included *Margaronia* (*Glyphodes*) *unionalis*, Hb., on young shoots of olive trees; larvae of *Cosmolyce* (*Lampides*) *boetica*, L., in pods of cowpeas and French beans; and *Platyedra gossypiella*, Saund., on late-sown cotton.

In experiments with bait sprays for the control of *Dacus oleae*, Gmel., on olive, mixtures of different sweetening substances poisoned with sodium arsenite, and others of Clensel or ammonium sulphate with sodium fluosilicate were applied to the trees, but no significant degree of control was obtained. In further experiments, glass globe-type fly traps were used for baits of 0·3 per cent. sodium arsenite containing 10 per cent. molasses, grape juice, or carob honey (made by steeping carob pods in water), 10 per cent. molasses with 1 per cent. ammonium sulphate, or 1 per cent. ammonium sulphate alone. A bait of Clensel, 1 : 30, was also used. The most attractive baits in order of efficiency were ammonium sulphate alone, ammonium sulphate with molasses, and grape juice. Ammonium sulphate attracted few insects other than *Dacus*, but many species were taken at the other baits. In further bait-trap experiments, the greatest numbers of *Ceratitis capitata*, Wied., were attracted by 10 per cent. grape juice.

PARKER (L. B.). **Seven new Species of Asiatic** *Tiphia*.—*J. N. Y. ent. Soc.* **45** no. 3–4 pp. 269–290. New York, N.Y., 1937.

Descriptions are given of both sexes of 7 species of *Tiphia* collected in Japan and Korea in connection with the export of Scoliids to New Jersey for the control of *Popillia japonica*, Newm. Keys to the males and females are given, and also a table showing the position that the species would occupy in the key of Allen & Jaynes [*cf. R.A.E.*, A **18** 256].

Nelson (F. C.). **The Use of Honey Bees for testing liquid Insecticides.** —*J. N. Y. ent. Soc.* **45** no. 3–4 pp. 341–352, 4 figs. New York, N.Y., 1937.

During investigations in 1925 on comparative tests of nerve-poison insecticides such as pyrethrum in atomised sprays, honey-bees were found suitable as experimental insects. Through a hole in the top of the hive, the bees were allowed to enter wire cages, consisting of an outer hemisphere 5 ins. in diameter and an inner cone about 4 ins. high. The cages, each containing about ten individuals, were placed upside down in glass cylinders, and sprayed from above, care being taken that the spray was directed at the centre of the cage. The bees were fed on honey, and 40 cages were used in a test. The paper includes a description of the spraying equipment and procedure, sample results and a discussion of the advantages and disadvantages of the method.

The General Sketch of the Bureau of Entomology, Hangchow, China [*In Chinese and English.*]—*Spec. Publ.* [*Bull.*] *Bur. Ent. Hangchow* no. 28, 12 pp. Hangchow, Chekiang, June 1935. [Recd. November 1937.]

This is a general account of the history, organisation and activities of the Bureau of Entomology, Hangchow. A table shows the losses due to damage by the more important insect pests in the Province of Chekiang in recent years.

Chiu (Shin-foon). **Notes on the natural Enemies of the Paddy Borer, *Schoenobius incertellus* Walker in Canton with a List of its Natural Enemies in the World.** [*In Chinese.*]—*Ent. & Phytopath.* **5** no. 22 pp. 442–457, 4 refs. Hangchow, 1st August 1937. (With a Summary in English.)

A list is given of the natural enemies of *Schoenobius bipunctifer*, Wlk. (*incertellus*, Wlk.) throughout the world, and those occurring in Canton are briefly discussed. Five of the parasites, *Telenomus* (*Phanurus*) *rowani*, Gah., *Tetrastichus schoenobii*, Ferrière, *Amauromorpha metathoracica*, Ashm., *Shirakia schoenobii*, Vier. (*dorsalis*, Mats.), and *Elasmus albopictus*, Crwf., are recorded for the first time from China.

Browne (F. G.) & Foenander (E. C.). **An entomological Survey of tapped Jelutong Trees.**—*Malay. Forester* **6** no. 4 pp. 240–254, 2 figs., 2 pls., 5 refs. Kuala Lumpur, October 1937.

The following is substantially the authors' summary: A greatly increased demand for the latex of jelutong (*Dyera costulata*) has necessitated the opening of large reserve areas in Malaya to tapping. Mortality among the tapped trees is high, owing mainly to insect attack, and it is feared that the present mature trees may be exhausted or at least greatly reduced in numbers before young crops can be brought into bearing. Trapped trees support a characteristic insect fauna, dominated by four Coleoptera, the Lamiid, *Batocera rubus*, L. the Platypid, *Platypus suffodiens malayensis*, Schedl, the Brenthid, *Schizotrachelus cameratus*, Lacord., and the Curculionid, *Acicnemis vehemens*, Hbtl. The final destruction of the tree is usually the work

of termites and fungi. The habits of the various members of the fauna are briefly discussed. *P. suffodiens malayensis* is apparently a specialised variety ; it has not been recorded from trees other than jelutong. Attack may occur through wounds or dead bark, or through the bark galleries of *B. rubus*, but infestation is often extensive in sickly or dying trees. The variety *malayensis* is apparently much more common in Malaya than the typical, and polyphagous, *P. suffodiens*, Samps., and probably owes its abundance to the extensive tapping of jelutong. Infestation by *B. rubus* is correlated with reduced vigour of the tree, which may be brought about by age, suppression, disease, or injury. Sound trees of almost any age can apparently resist infestation, but tapping, whether good or bad, eventually brings them within the zone of susceptibility. There is a typical distribution of infestation according to the condition of the tree. Various measures for the control of *B. rubus* are discussed, and it is considered that the most promising methods are exposure to the sun, and the collection of eggs and larvae from the panel while tapping is in progress. Intermittent tapping and the question of resistant varieties of jelutong are also thought to be worthy of further investigation.

Browne (F. G.). **A Note on the Defoliation of Sendok-sendok** (*Endospermum malaccense*).—*Malay. Forester* **6** no. 4 pp. 267–269, 1 pl. Kuala Lumpur, October 1937.

Endospermum malaccense, the timber of which is valued in some districts of Malaya for plywood, was defoliated in 1937 by the larvae of *Urapteroides astheniata*, Gn. The outbreak began in 1934, and the average annual increase in the girth of attacked trees fell by 23·3 per cent. in one year, and the rate of growth had decreased by 52·9 per cent. after repeated attacks for 3 years. This Uraniid, though very common in the Malay Peninsula, has not been recorded with certainty from any other species of food-plant. The first signs of attack are small brown patches on the leaves, covered by a fine web under which the larva feeds by gnawing away the epidermis, leaving only the larger veins. Not more than two larvae usually occur on one leaf. Pupation takes place on the leaf, and the pupal period in the laboratory lasted 8–10 days. One of the pupae that was being reared was parasitised by a Tachinid.

Tjoa Tjien Mo. **Aanteekeningen over eenige schadelijke insecten op** *Indigofera endecaphylla* **en** *Tephrosia purpurea*. [Notes on some injurious Insects on *I. endecaphylla* and *T. purpurea*.]—*Theearchief*, 1937 pp. 176–182, 3 figs., 1 pl. Buitenzorg, 1937.

A case of complete defoliation of *Indigofera endecaphylla* by *Zizina otis lysizone*, Sn., has been reported from West Java, though usually the attack is not so severe. All stages of this Lycaenid are described. The eggs are usually distributed on the underside of the leaves, and the egg, larval and pupal stages last 3, 6 and 4 days, respectively.

Tephrosia purpurea is attacked by a number of insects in Java, all of which feed chiefly on the flowers and flower buds, the foliage being almost unattacked. They include three species of Lepidoptera, *Euproctis minor*, Sn., *Maruca testulalis*, Geyer, and *Hemithea costipunctata simplex*, Warr., all stages of which (except the eggs of *Maruca*) are described, and 16 other insects, a list of which is given. Only the

first two, however, cause any significant injury. *E. minor* oviposits on the leaves, and the egg, larval and pupal stages last 6, 17 and 12 days, respectively. Larvae of *Maruca testulalis* live inside the flowers, singly as a rule, and require several flowers to complete development. *Phanerotoma philippinensis*, Ashm., was bred from some of the larvae of this Pyralid, and another Hymenopterous parasite from a pupa.

Andrewartha (H. G.). **Locusts and Grasshoppers in South Australia —some Records of past Outbreaks.**—*J. Dep. Agric. S. Aust.* **41** no. 4 pp. 366–368, 2 refs. Adelaide, November 1937.

The outbreaks of *Chortoicetes terminifera*, Wlk., and of *Austroicetes jungi*, Branc., in South Australia between 1844 and 1917 are enumerated.

Insect Pests and their Control.—*Agric. Gaz. N.S.W.* **48** pt. 9 pp. 513–516, 11 figs., 1 ref. Sydney, 1st September 1937.

This part of a series on insect pests in New South Wales [*cf. R.A.E.*, A **26** 56] includes short descriptions of the larvae and adults of the Noctuid, *Apina callisto*, Wlk., which may occasionally cause minor damage to pasture grasses, and of the Limacodid, *Doratifera vulnerans*, Lewin. The larvae of the latter usually feed on *Eucalyptus* spp., but sometimes cause defoliation of apricots in the late summer. The pupae hibernate in cup-shaped cocoons attached to twigs. The larvae may be controlled by a spray of 1 lb. lead arsenate in 40 gals. water. Lead arsenate at the same concentration is also effective against *Phalaenoides glycine*, Lewin, on grape-vines. The larvae of this Agaristid are attacked by a Eulophid parasite [*cf.* **25** 294], and by the predacious Pentatomid, *Oechalia consocialis*, Boisd., and the eggs are parasitised by a Chalcidoid.

Zanzibar Protectorate. **Plant Protection Decree, 1937.**—No. 9 of 1937, 6 pp. Zanzibar, 11th June 1937. [Recd. November 1937.]

The provisions of this Decree, which supersedes an earlier one [*R.A.E.*, A **11** 349], follow closely those of the Plant Protection Ordinance, 1937, of Tanganyika Territory [**25** 701] and empower the authorities in Zanzibar to make rules for the prevention and control of pests of plants within the country and to prevent their introduction from abroad.

Uvarov (B. P.) & Milnthorpe (W.). **The Locust Outbreak in Africa and western Asia in 1936.**—*Econ. adv. Coun. Comm. Locust Contr.*, 55 pp., 9 maps, 11 pp. refs. London [H.M.S.O., 63–80–6] 1937. Price 3*s*.

In continuation of the similar survey for 1935 [*R.A.E.*, A **25** 506], the breeding and migrations in 1936 of *Schistocerca gregaria*, Forsk., *Locusta migratoria migratorioides*, R. & F., and *Nomadacris septemfasciata*, Serv., are discussed in detail and illustrated by a series of maps.

The western part of North Africa again remained free from *S. gregaria*. Some loose swarms of this species, believed to have come from Eritrea, appeared on the Red Sea coast of the Anglo-Egyptian Sudan, where local breeding, supplemented by that of invading

swarms, resulted in a fairly serious outbreak. Apparently similar breeding occurred in other countries bordering on the Red Sea, and some swarms escaped destruction in the winter areas, and went on their wanderings in the spring. Thus in April 1937 two swarms appeared in southern Transjordania, and in June some loose swarms appeared on the Mediterranean coast of Egypt, between Alexandria and the Libyan boundary, and laid eggs. They were exterminated, but their appearance indicates that a new outbreak of this locust may develop in the Sudanese-Arabian area. No swarms occurred in India or in South Africa.

Except for the western part north of the equator, the African continent was free of *L. m. migratorioides* during the year under review. In the west the situation is improving slowly, the infested area becoming smaller every year. In 1936, there was a further concentration of swarms round the known outbreak centre on the Middle Niger during the main breeding season, showing that at its declining stages an outbreak follows the same course, in the reverse direction, as at its outset, there being a gradual contraction of infested areas towards the original outbreak centre.

The outbreak of *N. septemfasciata* continues to decline, but breeding during the 1935–36 season was still fairly widespread, and it is anticipated that partial invasions will be experienced in most African countries south of the equator for another two to three years. In April 1937, the young swarms of the eleventh generation in Uganda developed an unexpected tendency to migrate northwards, which continued till August, by which time some swarms reached the northern provinces of the Anglo-Egyptian Sudan.

The appendices contain a note on the occurrence in 1936 of *Patanga succincta*, L., and *Locusta migratoria manilensis*, Meyen, in North Borneo, and a bibliography of papers dealing with locusts and grasshoppers, published in 1936, continuing and supplementing those in the previous surveys.

HARRIS (W. V.). **Annual Report of the Entomologist, 1936.**—*Rep. Dep. Agric. Tanganyika 1936* pp. 88–94. Dar-es-Salaam, 1937.

Most of the information on pests of cotton in Tanganyika in 1936 has already been noticed [*R.A.E.*, A **25** 362]. In the east, a species of *Chelonus* parasitised 7 per cent. of *Platyedra gossypiella*, Saund., the highest recorded parasitism of this species by a Braconid in Tanganyika, and *Pediculoides ventricosus*, Newp., was found for the first time on larvae in bolls that had already opened. Of 45 larvae isolated in the laboratory, 17 gave rise to moths, the others dying as a result of attack by *Pediculoides*. *Dysdercus orientalis* var. *pulchra*, Schout., is recorded for the first time as injurious to cotton in the territory. *Calidea bohemani*, Stål, is the prevalent species of its genus in the east, while only a variety of *C. dregii*, Germ., is known in the west. Typical *C. dregii* has only been obtained in the south.

The larvae of *Opogona chlorophanes*, Meyr., bored stems and roots of cassava in the north-east, but were not observed in the old-established cassava-growing areas. *Lepidosaphes dispar*, Vayss., occurs on cassava over a wide area in the south. It is usually heavily attacked by *Chilocorus distigma*, Klug. *Zonocerus elegans*, Thnb., was abundant on the coast, damaging cassava and garden

plants. Rice was attacked by the Cercopid, *Locris neumanni*, Jac., in the north, and by a Cixiid, *Oliarus* sp., on the coast.

Vegetable pests include *Cirphis loreyi*, Dup., and *Thrips tabaci*, Lind., on onion, *Plutella maculipennis*, Curt. (*cruciferarum*, Zell.), on cabbage, and the sawfly, *Athalia sjöstedti*, Knw., on turnip. There has been a reduction in the numbers of the sisal weevil [*Scyphophorus acupunctatus*, Gyll.]; *Aspidiotus* sp. (? *destructor*, Sign.) occurred on sisal in isolated cases. Coffee in the north-west was attacked more severely than usual by *Epicampoptera* (*Metadrepana*) *marantica*, Tams, and *Deudorix lorisona*, Hew., occurred on it in Bugufi. *Monochamus* (*Monohammus*) *centralis*, Duv., was reported for the first time on coffee in the north-west, where a new leaf-miner, *Acrocercops chalybophanes*, Meyr. [*cf.* **26** 68], was also found. *Dirphya usambica*, Kolbe, was bred from *Rytigynia schumani* in the north-east (Kilimanjaro).

Paradichlorobenzene and two proprietary soil fumigants gave good results in the treatment of trees and ornamental shrubs attacked below ground level by termites, principally *Microtermes redenianus*, Sjöst., and *Allodontermes morogorensis*, Harris, and the use of a soil fumigant when trees or shrubs are planted is also recommended. Several species, including *Rhinotermes* (*Schedorhinotermes*) *lamanianus*, Sjöst., *Microcerotermes parvus*, Hav., and *Coptotermes amanii*, Sjöst., frequently injure older trees, especially after careless pruning. *R. lamanianus* is widely distributed in forest areas and appears to attack a limited range of trees, including avocado and *Jacaranda*. Fumigants should be used, and the holes then protected from rain to prevent further rotting. A species of *Amitermes* (*Hamitermes*) is now known to attack cotton. *Hodotermes mossambicus*, Hagen, attacks grass clumps in the Western and Lake Provinces, thus hastening soil erosion, and *Allodontermes morogorensis* and *Eutermes* sp. injure lawns during dry periods, but can be held in check by dusting with Paris green.

Nomadacris septemfasciata, Serv., was less abundant than it has been in recent years.

Smee (C.). **Report of the Entomologist.**—*Rep. Dep. Agric. Nyasaland 1936* pp. 20–24. Zomba, 1937.

Damage by stainers [*Dysdercus* spp.] to cotton in Nyasaland was more severe in 1936 than for the past few years, and there may possibly be some connection between it and the relative humidity, which was about 10 per cent. higher than in the 3 preceding years. Of 400 bolls picked in various situations in the Lower River districts and examined in August, 42 and 11 per cent. were infested with stainers and bollworms, respectively. It is thought that bollworms could be satisfactorily controlled by the enforcement of a dead season of 2 months between the destruction of old crops and the planting of new ones, but this is difficult to regulate owing to the multiplicity of planting dates where normal and river flood lands are in juxtaposition. In districts where *Diparopsis castanea*, Hmps., is present, the dead season should include part of the first rains, as most of the moths emerge during the first showers, and there are very few wild plants on which they oviposit. Kidney-cotton plants are, however, infested, and in all new cotton-growing areas they should be eradicated. Other

cotton pests that were more numerous than usual were *Sylepta derogata*, F., *Cosmophila erosa*, Hb., and *Acontia graellsii*, Feisth., this last species being parasitised by a Braconid, *Disophrys* sp. The tops of cotton plants were attacked by the Lamiid, *Tragischoschema wahlbergi*, Fhs., and damage by its stem-boring larvae occurred commonly, especially in the vicinity of *Sterculia* or *Dombeya*, which appear to be the alternative food-plants.

Pests of cereals included *Laphygma exempta*, Wlk., which was parasitised by a fungus, *Empusa* sp., and a Miscogasterid; and *Epicauta velata*, Gerst., which severely damaged all maize and millet flowers in the Lower Shire district. The larvae of this Meloid are thought to be predacious on locust eggs, and its abundance may have been connected with the locust outbreak.

Cajanus indicus was infested by *Helopeltis bergrothi*, Reut., which oviposited in the main stems just above ground level, and apparently not at all in the young upper shoots; ratooned plants may thus act as a reservoir for this bug. Tung-nut trees (*Aleurites*) were attacked by *Icerya purchasi*, Mask., and were more severely damaged by *Aspidiotus hederae*, Vall., *A. rapax*, Comst., and *A. lataniae*, Sign., the leaf fall of the infested trees in the dormant season being much delayed. These last three Coccids also occur on *Sesbania* and *Melia*. They were heavily parasitised by Chalcidoids but infestation was not checked. Effective control of mites on tea was obtained by double spraying at 10-day intervals with colloidal sulphur, preferably with the addition of soft soap. Rosette disease of groundnuts [*Arachis*], which is transmitted by *Aphis laburni*, Kalt. (*leguminosae*, Theo.), caused the loss of most of the crop in many districts.

Pests recorded for the first time were *Aspidiotus sylvaticus*, Ldgr., and *Heliothrips haemorrhoidalis*, Bch., on tea, and the Halticid, *Aphthona bimaculata*, Jac., on foliage of *Sesamum*. Other pests included the Noctuids, *Anticarsia irrorata*, F., and *Amyna octo*, Gn., on the foliage of cowpeas (*Vigna*), and the Plataspid, *Brachyplatys testudonigra*, DeG., on *Dolichos* sp.

Damage done by bands of hoppers and adults of *Nomadacris septemfasciata*, Serv., was considerably less than in previous years [*cf. R.A.E.*, A **25** 95, etc.]. There was a prolonged hopper period in most areas [*cf.* **25** 104], the bands were scattered and quiescent in some, and habits of the *dissocians* phase were conspicuous in the Domira Bay district. The first flying swarms developed in March, and by April most hopper bands had reached the adult stage. Dull weather with high humidity during the middle of the year appeared to check any concentrated flights, but in December a definite north and north-west movement set in, and some swarms penetrated districts that had been free nearly the whole year. Except for an occasional swarm entering from North Rhodesia, however, the three most northern districts were not invaded. Re-invasion of the Protectorate by swarms from the Zambesi valley and territory to the south and south-west was rather extensive at the end of the year. Oviposition in the Lower River districts and the Shire Highlands first occurred about 14th December, nearly a month later than in 1935. The eggs of this locust were destroyed by larvae of *Chlaenius obesus*, Laferté, *Mylabris dicincta*, Bert., *M. pertinax*, Pér., *Epicauta designata*, Pér., *Scelio howardi*, Crwf., and *Stomatorrhina lunata*, F., and the hoppers were attacked by the Tettigoniid, *Acanthoplus speiseri*, Brancs., and the Reduviid, *Rhynocoris violentus*, Germ.

The tree locust, *Anacridium moestum*, Serv., was recorded from Port Herald.

DESLANDES (J.). **A oiticica e seus males.** [*Licania rigida* and Factors harmful to it.]—*Campo* **8** no. 91 pp. 18–20, 8 figs. Rio de Janeiro, July 1937.

Licania rigida is becoming of increasing importance in Brazil, as an oil is obtained from its seed kernels. The average annual crop per tree is about 4 cwt., and the chief pest is *Conotrachelus licaniae*, Mshl., the larvae of which tunnel the kernels, reducing their weight but not rendering them unusable. The adult weevil lays one or more eggs on the young fruits ; the immature fruits drop in large numbers in December and early January, and most of them are infested, but it is not known whether the infestation causes them to fall. It is suggested that the larvae in fallen fruits should be destroyed by collecting the fruits and subjecting them to manufacture or to fumigation with carbon bisulphide.

MONTE (O.). **O bicho da anona** (*Syprestia carinosa*, **Casey**).—*Campo* **8** no. 93 pp. 26–27, 1 fig. Rio de Janeiro, September 1937.

The larvae of a weevil, *Syprestia carinosa*, Csy., are recorded as causing the fall of all the immature fruits of an *Anona* tree in Bello Horizonte, Brazil. After feeding in the pulp they destroyed the embryos in the seeds and pupated in the fruit. The larval stage lasted 2 months and the pupal stage 6 months. More than one larva could be found in a fruit. A species of *Lydamis* was associated with *S. carinosa*, but no observations were made on this weevil.

HAMBLETON (E. J.). **Uma nova especie de** *Gasterocercodes* **Pierce, broca do algodoeiro no Brasil (Col. Curcul.).** [A new Species of *Gasterocercodes* Pierce, a Borer of Cotton in Brazil.]—*Rev. Ent.* **7** fasc. 4 pp. 345–350, 2 figs., 7 refs. Rio de Janeiro, 11th October 1937.

The species of *Gasterocercodes* that bores in the roots of cotton in Brazil is here described as *G. brasiliensis*, sp. n. ; it had previously been misidentified as *G. gossypii*, Pierce [*R.A.E.*, A **14** 238 ; **25** 509, 510], the only known species of the genus.

RONNA (A.). **Novos dados sobre os habitos de** *Melaloncha ronnai* **Borgmeier (Dipt. Phoridae), endoparasita de** *Apis mellifica* **L.** [New Data on the Habits of *M. ronnai*, Borgm., an Endoparasite of *A. mellifera*, L.]—*Rev. Ent.* **7** fasc. 4 pp. 409–413, 2 refs. Rio de Janeiro, 11th October 1937.

Further particulars are given on the habits of *Melaloncha ronnai*, Borgm., the Phorid endoparasite of honey-bees in Brazil [*R.A.E.*, A **24** 503]. Up to 50 per cent. of the bees of some hives were parasitised. The use is suggested of trap-glasses containing soap solution in which some dead bees have been placed. Decomposition of this bait is stated by an apiarist to make it highly attractive to the Phorids.

Cook (M. T.), Otero (J. I.) & others. **Entomology.**—*Bull. P.R. agric. Exp. Sta.* no. 44 pp. 58–67. San Juan, P.R., 1937.

This section of an account of the activities of the Agricultural Experiment Station at Rio Piedras, Porto Rico, during the 25 years of its existence comprises a review of work on the control of insect pests on the island, much of which has already been noticed from the Reports and Bulletins of the station.

Mackie (D. B.) & Carter (W. B.). **Pest Control in rural Warehouses and suggested Improvements.**—*Bull. Dep. Agric. Calif.* **26** no. 3 pp. 275–293, 6 figs., 3 refs. Sacramento, Calif., 1937.

A brief account is given of the results of a survey of the distribution of pests of stored grain in rural warehouses in the Sacramento Valley, California, in 1933, together with a summary of the bionomics of those that can infest undamaged grain, *viz.*, *Calandra* (*Sitophilus*) *granaria*, L., and *Sitotroga cerealella*, Ol., which were widely distributed, and *C.* (*S.*) *oryzae*, L., and *Rhizopertha dominica*, F., which occurred locally. Methods of fumigation are then discussed, and dosages of various fumigants calculated to kill 99 per cent. of *C. granaria* and *Tribolium confusum*, Duv., in 5 hours at 77°F. are quoted from a paper already noticed [*R.A.E.*, A **25** 768]. Sprays of oil emulsions and other contact insecticides are recommended for application to empty warehouses. The use of dry insecticides mixed in with the grain is also discussed.

Report of Special Committee on Border Quarantines—California State Chamber of Commerce.—*Bull. Dep. Agric. Calif.* **26** no. 3 pp. 294–308. Sacramento, Calif., 1937.

This is the report of a committee appointed to review the entire subject of the value and necessity of border quarantines in California ; it is concluded that the quarantines are of high value and should be maintained. Lists are given of the important pests intercepted at the quarantine stations in 1936.

McKenzie (H. L.) & Lindgren (D. L.). **Avocado Fumigation Investigations.**—*Bull. Dep. Agric. Calif.* **26** no. 3 pp. 311–319, 4 figs. Sacramento, Calif., 1937.

An account is given of experiments in California to find the optimum conditions for tent fumigation of avocado against *Aspidiotus lataniae*, Sign. Monthly fumigation tests were carried on during 1934, 1935 and 1936.

A series of ten experiments was conducted on form trees to determine the leakage of gas through 8 oz. duck canvas (citrus fumigation tent) and 350 sheeting (avocado fumigation tent), which is lighter in weight and causes less breakage of the branches. Two form trees were fumigated simultaneously with hydrocyanic acid gas at 59–70°F. and 80–95 per cent. relative humidity. One was covered with 8 oz. canvas and one with 350 sheeting. There was no wind. The mean average concentration during 40 minutes was 8–12 per cent. higher under the canvas tent than under the 350 sheeting, even though the initial concentration was slightly higher under the sheeting. A slight breeze increased the differences between the concentrations, the 350 sheeting

tending to flap and increase leakage. In other experiments, A. F. Swain and R. P. Buckner found that the mean concentration of HCN under citrus tents and 350 sheeting differed by about 10 per cent., regardless of the method by which the HCN was introduced.

In tests on the rates of diffusion of the fumigant when applied in different forms, scale-infested trees were fumigated for 45 minutes with an 18 cc. schedule of HCN (measured in liquid form) applied as a gas or as a finely divided liquid, and a 2 oz. schedule (about the equivalent quantity) of calcium cyanide containing 40–50 per cent. $Ca(CN)_2$. The concentration of gas under the tents was determined at intervals of one-half to forty minutes following the introduction of the HCN. In all three years in which tests were conducted, the average mean concentration of HCN produced by the application of the fumigant as a gas was greater than that produced by its application as calcium cyanide. The fumigant was only applied as a liquid in one year, and then the average mean concentration was less than that given by either of the other methods. Application as a gas gave the highest initial concentration, but at the end of 40 minutes the concentration was lower than in the tent where calcium cyanide had been employed. The concentration obtained by calcium cyanide was lower but more even, indicating that in 40 minutes all the HCN had not been evolved. Tests in 1934 showed that all three methods of application gave about the same degree of control. In 1935 and 1936, applications as a gas and as calcium cyanide were compared and mortalities of 98·86 and 94·15 per cent., respectively, were produced in 1935, and of 99·57 and 99·12 per cent. in 1936. Control of *A. lataniae* given by fumigation was consistently high from July to November, but decreased in December. The seasonal variation in mortality was similar for application as a gas and as calcium cyanide, but the former gave a better kill in every case but one. Possibly the scale becomes more resistant with a drop in temperature, in contrast to *Aonidiella aurantii*, Mask. [*R.A.E.*, A **23** 38]. It is probably advisable to avoid fumigation while the tree is flowering and until the fruit has attained approximately the size of a hen's egg, as in the event of injury the bloom turns brown and dies, and the fruit falls. Older fruits are rarely injured. During the period in which the work was carried on, it was observed that the first fumigation of a series carried out in one evening almost always gave better results than any of the succeeding ones. This may be due to drift gas and protective stupefaction, drop in temperature, increase in relative humidity, or the interaction of all these factors.

LANGE (W. H.) & MICHELBACHER (A. E.). **Two closely related Species of *Heliothis* found in Tomato Fields of Central California.**—*Bull. Dep. Agric. Calif.* **26** no. 3 pp. 320–325, 2 pl., 8 figs., 6 refs. Sacramento, Calif., 1937.

In view of the possibility of confusion between *Heliothis armigera*, Hb. (*obsoleta*, F.) and *H. phloxiphaga*, Grote & Rob., both of which may be abundant in tomato fields in California, their bionomics and distribution are briefly discussed. It is possible that some of the damage to plants attributed to *armigera* may be due to *phloxiphaga*, but the latter could not be reared on tomato. The distinguishing characters of the different stages are given in a table. Both species

have a wide range of food-plants. The seasonal activities of *armigera* are summarised [*cf. R.A.E.*, A **24** 661] ; a mature larva of *phloxiphaga* was taken in a lucerne field in April, and adults were abundant in tomato fields in June and in a lucerne field in July.

Donohoe (H. C.), Simmons (P.), Barnes (D. F.) & Fisher (C. K.). **The Importance of Mulberries in Raisin Moth Control.**—*Bull. Dep. Agric. Calif.* **26** no. 3 pp. 339–340. Sacramento, Calif., 1937.

Studies carried out in California in 1935 indicated that over 90 per cent. of the spring emergence of adults of *Ephestia figulilella*, Gregson, occurs when mulberries are practically the only food material available for oviposition [*cf. R.A.E.*, A **23** 19]. Most of the eggs are laid within the first week of adult life. Mulberry trees are found in practically all areas where fruit is grown for drying, and in June and July the fallen mulberries are very severely infested. It is therefore suggested that the dropped mulberries should be raked out from beneath the trees at intervals of not more than 2 weeks and either spread in a thin layer in the sun, in order to kill the larvae, or used as food for livestock.

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Harris (W. V.). **Annotated List of Insects injurious to native Food Crops in Tanganyika.**—*Bull. ent. Res.* **28** pt. 3 pp. 483–488. London, October 1937.

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Speicher (B. R.). **Oogenesis in a thelytokous Wasp,** *Nemeritis canescens* **(Grav.).**—*J. Morph.* **61** no. 3 pp. 453–472, 2 pls. 1 fig., 14 refs. Philadelphia, Pa, 5th December 1937.

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Uchida (T.). **Ein neuer Schmarotzer von** *Dendrolimus spectabilis* **aus China.** [A new Parasite, *Pimpla* (*Itoplectis*) *nigribasalis*, sp. n., from *D. spectabilis* in China.]—*Insecta matsum.* **11** no. 4 p. 131. Sapporo, June 1937.

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CONTENTS.

CONTENTS—*cont.*

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